Jacobs

# Threemile River Bridge Replacement at Mile Post 6.84

## Notice of Intent - Norton

March 26, 2021

**Submitted by:**
**Massachusetts Department of Transportation (MassDOT)**

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

## Contents

**MassDOT Letters**

**WPA 3 Form**

**1. Introduction .......... 1**

1.1 Purpose and Need .......... 1

**2. Existing Conditions .......... 2**

2.1 Desktop Review for Resource Areas .......... 2

2.2 Wetland and Waterbody Resources .......... 3

**3. Project Description .......... 5**

3.1 Summary of Impacts .......... 6

3.2 Alternatives Analysis .......... 6

**4. Regulatory Compliance .......... 7**

4.1 Massachusetts Wetlands Protection Act .......... 7

4.2 Stream Crossing Standards and BMPs .......... 10

4.3 Clean Water Act Section 404 .......... 10

4.4 Clean Water Act Section 401 .......... 10

4.5 Section 106 of the National Historic Preservation Act .......... 10

**5. Construction Mitigation Measures .......... 11**

5.1 Avoidance and Minimization Measures .......... 11

**Figures**

**Attachment A – Site Plans**

**Attachment B – USACE Data Forms**

**Attachment C – Photographic Log**

**Attachment D – Stormwater Checklist**

**Attachment E – Hydraulic Analysis**

**Attachment F – NHESP Consultation**

# MassDOT Letters

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

March 26, 2021

Jennifer Carlino
Norton Conservation Commission
70 East Main Street
Norton, MA 02766

Subject: MassDOT Rail and Transit Division
Threemile River Bridge Replacement MP 6.84
Norton, Bristol County, MA
Notice of Intent

Dear Ms. Carlino,

On behalf of the Massachusetts Department of Transportation (MassDOT) Rail and Transit Division, Jacobs is submitting this Notice of Intent (NOI) for proposed track embankement/ballast widening, as well as replacement of the existing bridge (Bridge No. N-23-029) that spans the Threemile River in the Town of Norton, Bristol County, Massachusetts. The work will take place along the Attleboro Secondary Line (also known as the Framingham Secondary and part of Middleboro Subdivision).

It is critical to highlight that pursuant to Section 24 of the 2014 Transportation Bond Bill, the bridge replacement and all work associated with the replacement is exempt from the WPA[1]. The Bond Bill exempts bridge projects that involve the repair, reconstruction, replacement, or demolition of existing public transportation structures. Accordingly, Sheet 5 of the Site Plans (Attachment A), has removed impact numbers associated with the bridge replacement.

The purpose of the Project is to replace the existing bridge structure with new steel girders, pre-cast head and wing walls. The original date of construction for the bridge is 1883. The bridge is in poor condition and continues to deteriorate. During the bridge replacement activities, the track embankement/ballast will be addressed and widened to allow continued access for maintenance, as well as provide better stability for the railroad right-of-way.

Should you have any questions or comments regarding the proposed work, please feel free to call me at (857) 368-8957 or Kyle Purdy at Jacobs Engineering at (518) 598-8242.

Sincerely,

Chalita Belfield

Chalita Belfield
Director of Railroad Properties

cc: Dan Gilmore, MassDEP SERO
Kyle Purdy, Jacobs Engineering Group

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[1] Section 24 of the 2014 Transportation Bond Bill (Chapter 79 Acts) exempts bridge projects of the Massachusetts Department of Transportation and its divisions MBTA from the requirements of MGL Chapter 131, section 40 (WPA) if the design is substantially the functional equivalent of, and in similar alignment to, the structure to be reconstructed or replaced.

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

March 26, 2021

Dan Gilmore
MassDEP Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347

Subject: MassDOT Rail and Transit Division
Threemile River Bridge Replacement MP 6.84
Norton, Bristol County, MA
Notice of Intent

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On behalf of the Massachusetts Department of Transportation (MassDOT) Rail and Transit Division, Jacobs is submitting this Notice of Intent (NOI) for proposed track embankement/ballast widening, as well as replacement of the existing bridge (Bridge No. N-23-029) that spans the Threemile River in the Town of Norton, Bristol County, Massachusetts. The work will take place along the Attleboro Secondary Line (also known as the Framingham Secondary and part of Middleboro Subdivision).

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Sincerely,

Chalita Belfield

Chalita Belfield
Director of Railroad Properties

cc: Jennifer Carlino, Norton Conservation Commission
Michele Restino, Taunton Conservation Commission
Kyle Purdy, Jacobs Engineering Group

---

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# WPA 3 Form

**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands

# WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Norton
City/Town

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

## A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

| | | |
|---|---|---|
| Threemile River Bridge Replacement MP 6.84 | Norton | 02766 |
| a. Street Address | b. City/Town | c. Zip Code |

| | | |
|---|---|---|
| Latitude and Longitude: | N 41° 56' 18.7" | W -71° 09' 21.0" |
| | d. Latitude | e. Longitude |

| | |
|---|---|
| 33-11 | N/A |
| f. Assessors Map/Plat Number | g. Parcel /Lot Number |

2. Applicant:

| | |
|---|---|
| Chalita | Belfield |
| a. First Name | b. Last Name |

Massachusetts Department of Transportation
c. Organization

10 Park Plaza, Suite 4160
d. Street Address

| | | |
|---|---|---|
| Boston | MA | 02116 |
| e. City/Town | f. State | g. Zip Code |
| 857.368.8957 | | Chalita.Belfield@state.ma.us |
| h. Phone Number | i. Fax Number | j. Email Address |

3. Property owner (required if different from applicant): ☐ Check if more than one owner

| | |
|---|---|
| | |
| a. First Name | b. Last Name |

c. Organization

d. Street Address

| | | |
|---|---|---|
| | | |
| e. City/Town | f. State | g. Zip Code |
| | | |
| h. Phone Number | i. Fax Number | j. Email address |

4. Representative (if any):

| | |
|---|---|
| Kyle | Purdy |
| a. First Name | b. Last Name |

Jacobs Engineering Group
c. Company

120 Saint James Avenue, 5th Floor
d. Street Address

| | | |
|---|---|---|
| Boston | MA | 02116 |
| e. City/Town | f. State | g. Zip Code |
| 518.598.8242 | NA | Kyle.Purdy@jacobs.com |
| h. Phone Number | i. Fax Number | j. Email address |

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

| | | |
|---|---|---|
| $750.00 | Exempt | $387.50 |
| a. Total Fee Paid | b. State Fee Paid | c. City/Town Fee Paid |

## A. General Information (continued)

6. General Project Description:

The project proposes to widen the existing track embankment/ballast, as well as replace the existing bridge (Bridge No. N-23-029) that is located along the Attleboro Secondary Line (also known as the Framingham Secondary and part of Middleboro Subdivision) located near MP 6.84.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☒ Transportation
9. ☐ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☒ Yes ☐ No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

310 CMR 10.53(3)(l) Maintenance of water dependent uses.
2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

| | |
|---|---|
| Bristol<br>a. County | N/A<br>b. Certificate # (if registered land) |
| 2264<br>c. Book | 59<br>d. Page Number |

## B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

## B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

| Resource Area | Size of Proposed Alteration | Proposed Replacement (if any) |
|---|---|---|
| a. ☐ Bank | 1. linear feet | 2. linear feet |
| b. ☒ Bordering Vegetated Wetland | 5,365 (BZ perm.) 1,682 (BZ temp.)<br>1. square feet | 1,682 (buffer zone)<br>2. square feet |
| c. ☐ Land Under Waterbodies and Waterways | 1. square feet<br>3. cubic yards dredged | 2. square feet |

| Resource Area | Size of Proposed Alteration | Proposed Replacement (if any) |
|---|---|---|
| d. ☐ Bordering Land Subject to Flooding | 1. square feet<br>3. cubic feet of flood storage lost | 2. square feet<br>4. cubic feet replaced |
| e. ☐ Isolated Land Subject to Flooding | 1. square feet<br>2. cubic feet of flood storage lost | 3. cubic feet replaced |

f. ☒ Riverfront Area

Threemile River
1. Name of Waterway (if available) - **specify coastal or inland**

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☒ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: 21,665 square feet

4. Proposed alteration of the Riverfront Area:

| | | |
|---|---|---|
| 7,681 | 634 | 7,047 |
| a. total square feet | b. square feet within 100 ft. | c. square feet between 100 ft. and 200 ft. |

5. Has an alternatives analysis been done and is it attached to this NOI? ☒ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☒ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

**Note:** for coastal riverfront areas, please complete **Section B.2.f.** above.

## B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

| Resource Area | Size of Proposed Alteration | Proposed Replacement (if any) |
|---|---|---|
| a. ☐ Designated Port Areas | Indicate size under Land Under the Ocean, below | |
| b. ☐ Land Under the Ocean | 1. square feet<br>2. cubic yards dredged | |
| c. ☐ Barrier Beach | Indicate size under Coastal Beaches and/or Coastal Dunes below | |
| d. ☐ Coastal Beaches | 1. square feet | 2. cubic yards beach nourishment |
| e. ☐ Coastal Dunes | 1. square feet | 2. cubic yards dune nourishment |

| | Size of Proposed Alteration | Proposed Replacement (if any) |
|---|---|---|
| f. ☐ Coastal Banks | 1. linear feet | |
| g. ☐ Rocky Intertidal Shores | 1. square feet | |
| h. ☐ Salt Marshes | 1. square feet | 2. sq ft restoration, rehab., creation |
| i. ☐ Land Under Salt Ponds | 1. square feet<br>2. cubic yards dredged | |
| j. ☐ Land Containing Shellfish | 1. square feet | |
| k. ☐ Fish Runs | Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above<br>1. cubic yards dredged | |
| l. ☐ Land Subject to Coastal Storm Flowage | 1. square feet | |

4. ☐ Restoration/Enhancement
If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW
b. square feet of Salt Marsh

5. ☒ Project Involves Stream Crossings

a. number of new stream crossings
1
b. number of replacement stream crossings

## C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

### Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

a. ☒ Yes ☐ No

**If yes, include proof of mailing or hand delivery of NOI to:**

**Natural Heritage and Endangered Species Program**
**Division of Fisheries and Wildlife**
**1 Rabbit Hill Road**
**Westborough, MA 01581**

October 2017
b. Date of map

If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

c. Submit Supplemental Information for Endangered Species Review[*]

1. ☐ Percentage/acreage of property to be altered:

(a) within wetland Resource Area ______
percentage/acreage

(b) outside Resource Area ______
percentage/acreage

2. ☐ Assessor's Map or right-of-way plan of site

2. ☒ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work [**]

(a) ☒ Project description (including description of impacts outside of wetland resource area & buffer zone)

(b) ☒ Photographs representative of the site

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[*] Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/). Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

[**] MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

## C. Other Applicable Standards and Requirements (cont'd)

(c) ☒ MESA filing fee (fee information available at http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_fee_schedule.htm). Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_exemptions.htm; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☒ Separate MESA review ongoing.
20-39827
a. NHESP Tracking #
12/28/2020
b. Date submitted to NHESP

3. ☒ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only    b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: DMF.EnvReview-South@state.ma.us

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: DMF.EnvReview-North@state.ma.us

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

## C. Other Applicable Standards and Requirements (cont'd)

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

**Online Users:** Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

a. ☒ Yes ☐ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

Threemile River Watershed (ACEC 29)
b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
   1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
   2. ☒ A portion of the site constitutes redevelopment
   3. ☐ Proprietary BMPs are included in the Stormwater Management System.

b. ☐ No. Check why the project is exempt:
   1. ☐ Single-family house
   2. ☐ Emergency road repair
   3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

## D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

**Online Users:** Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

## D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Threemile River Bridge Replacement at MP 6.84 NOI Plans
a. Plan Title

| | |
|---|---|
| Jacobs Engineering<br>b. Prepared By | John Wilson<br>c. Signed and Stamped by |
| March 23, 2021<br>d. Final Revision Date | 1" = 50'<br>e. Scale |
| f. Additional Plan or Document Title | g. Date |

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☒ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

## E. Fees

1. ☐ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

| | |
|---|---|
| 384<br>2. Municipal Check Number | 2/1/2021<br>3. Check date |
| Exempt<br>4. State Check Number | N/A<br>5. Check date |
| Kyle<br>6. Payor name on check: First Name | Purdy<br>7. Payor name on check: Last Name |

## F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

Chalita Belfield
1. Signature of Applicant

2/15/2021
2. Date

3. Signature of Property Owner (if different)

4. Date

Kyle Purdy
5. Signature of Representative (if any)

2/15/2021
6. Date

**For Conservation Commission:**
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

**For MassDEP:**
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

**Other:**
If the applicant has checked the “yes” box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands

# NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

✓ tab

✗ return

## A. Applicant Information

1. Location of Project:

| | |
|---|---|
| Threemile River Bridge Replacement MP 6.84 | Norton |
| a. Street Address | b. City/Town |
| 384 | $387.50 |
| c. Check number | d. Fee amount |

2. Applicant Mailing Address:

| | | |
|---|---|---|
| Chalita | | Belfield |
| a. First Name | | b. Last Name |

Massachusetts Department of Transportation
c. Organization

10 Park Plaza, Suite 4160
d. Mailing Address

| | | |
|---|---|---|
| Boston | MA | 02116 |
| e. City/Town | f. State | g. Zip Code |
| 857.368.8957 | | Chalita.Belfield@state.ma.us |
| h. Phone Number | i. Fax Number | j. Email Address |

3. Property Owner (if different):

| | |
|---|---|
| a. First Name | b. Last Name |

c. Organization

d. Mailing Address

| | | |
|---|---|---|
| e. City/Town | f. State | g. Zip Code |
| h. Phone Number | i. Fax Number | j. Email Address |

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

## B. Fees

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

**Step 1/Type of Activity:** Describe each type of activity that will occur in wetland resource area and buffer zone.

**Step 2/Number of Activities**: Identify the number of each type of activity.

**Step 3/Individual Activity Fee:** Identify each activity fee from the six project categories listed in the instructions.

**Step 4/Subtotal Activity Fee:** Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

**Step 5/Total Project Fee:** Determine the total project fee by adding the subtotal amounts from Step 4.

**Step 6/Fee Payments:** To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

## B. Fees (continued)

| Step 1/Type of Activity | Step 2/Number of Activities | Step 3/Individual Activity Fee | Step 4/Subtotal Activity Fee |
|---|---|---|---|
| 2.e. inland limited project | 1 | $500.00 x 1.5 | $750.00 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**Step 5/Total Project Fee:** $750.00

**Step 6/Fee Payments:**

Total Project Fee: $750.00
a. Total Fee from Step 5

State share of filing Fee: Exempt
b. 1/2 Total Fee **less $**12.50

City/Town share of filling Fee: $387.50
c. 1/2 Total Fee **plus** $12.50

## C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

**To MassDEP Regional Office** (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

60-7269/2313

384

**KYLE R PURDY**
133 EMERSON ST. APT 4
BOSTON, MA 02127

DATE 2-1-2021

PAY TO THE ORDER OF Town of Norton $ 387.50

Three hundred eighty seven dollars —— 50/100 DOLLARS

Security Features Included. Details on Back.

Santander

Santander Bank, N.A.

MEMO

Kyle Purdy

MP

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60-7269/2313

385

**KYLE R PURDY**
133 EMERSON ST. APT 4
BOSTON, MA 02127

DATE 2-1-2021

PAY TO THE ORDER OF City of Taunton $ 387.50

Three hundred eighty seven dollars —— 50/100 DOLLARS

Security Features Included. Details on Back.

Santander

Santander Bank, N.A.

MEMO

Kyle Purdy

MP

# 1. Introduction

In accordance with the Massachusetts Wetlands Protection Act (WPA) (M.G.L. Chapter 131, Section 40) and the implementing regulations (310 Code of Massachusetts Regulations (CMR) 10.00), Jacobs Engineering (Jacobs), on behalf of Massachusetts Department of Transportation (MassDOT) Rail and Transit Division has prepared this Notice of Intent (NOI) and supporting documentation for the replacement of Threemile River Bridge and associated railroad embankment work (Project). The bridge (Bridge No. N-23-029) is located along the Attleboro Secondary Line (also known as the Framingham Secondary and part of Middleboro Subdivision) at Mile Post (MP) 6.84 in the Town of Norton and City of Taunton, Massachusetts (Site). The coordinates for the center of the bridge are N 41° 56' 18.7", W -71° 09' 21.0". The existing bridge is a single-span, deck plate girder, spanning 46 feet, 9 inches (center to center of bearings). The steel superstructure supports a ballasted deck and carries a single track. The bridge is supported by granite block masonry abutments with concrete backwalls and granite block masonry wingwalls.

Pursuant to Section 24 of the 2014 Transportation Bond Bill, the bridge replacement and all work associated with the replacement is exempt from the WPA[1]. The Bond Bill exempts bridge projects that involve the repair, reconstruction, replacement, or demolition of existing public transportation structures. For the purposes of this application, bridge is defined as “any structure spanning and providing passage over water, railroad right-of-way, public or private way, other vehicular facility or other area.” Accordingly, Sheet 5 of the Site Plans (**Attachment A**), has removed impact numbers associated with the bridge replacement. These proposed impacts will be presented to Massachusetts Department of Environmental Protection (MassDEP) when filing the appropriate Water Quality Certification (WQC) Application. For more discussion on the anticipated WQC and other regulatory compliance, please refer to Section 4.4 below.

It is also imperative to highlight that this Notice of Intent highlights all activities proposed for the Project. However, as recommended by the Conservation Commissions, impacts relative to each municipal boundaries have been separated accordingly into two separate NOI filings. The proposed impacts to resource areas within the Town the Norton consists all associated track work that will be performed to ensure localized stability leading up to the bridge abutments. The work proposed within both the Town of Norton, as well as the City of Taunton consists solely of widen the existing embankment/ballast and is limited to impacting the 100-foot buffer zone of Bordering Vegetated Wetlands (BVW) and Bank and 200-foot Riverfront Area. For further clarification, the impact numbers are provided in **Table 1 and 2** below.

## 1.1 Purpose and Need

The purpose of the Project is to replace the existing bridge structure with new steel girders, pre-cast head and wing walls. The original date of construction for the bridge is 1883, the superstructure was replaced and the abutments modified in 1921. The bridge is in poor condition and continues to deteriorate. The underside of the deck timbers are splitting with rot observed at the girder ends. The railroad ties are weathered with several showing indication of rot and decay. The original stone abutments and foundations are displaying signs of cracking and potential failure. The southwest wingwall has an 8” gap between it and the stem, as well as the end of it is eroding and scouring. The backwalls are in serious dilapidated condition, with the concrete crumbling and large spalls and cracks throughout the entire surface. The southwest corner of the backwall has a wide vertical crack and is sliding towards the Threemile River channel. Further deterioration of the structure could result in the inability to operate trains over the compromised bridge, and would result in delivery delays for freight traffic, as well as the potential failure or need for emergency repairs that would result in significant rail outages. The goal for the bridge replacement is to improve long term rail operations reliability, protect the structure and ancillary features, including adjacent rail line embankments and the new structure's approach and departure aprons.

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[1] Section 24 of the 2014 Transportation Bond Bill (Chapter 79 Acts) exempts bridge projects of the Massachusetts Department of Transportation and its divisions MBTA from the requirements of MGL Chapter 30, sections 61, 62A – 62I (MEPA), MGL Chapter 91 (Public Waterfront Act), and MGL Chapter 131, section 40 (WPA) if the design is substantially the functional equivalent of, and in similar alignment to, the structure to be reconstructed or replaced.

# 2. Existing Conditions

According to the United States Geological Survey (USGS) Topographic Map, the approximate elevations for the Site ranges from 52 to 74 feet above mean sea level (**Figure 1**). The bridge spans Threemile River and is located approximately 1,100 feet east of the railroad right-of-way (ROW) and New Taunton Avenue (Route 140) intersection. The bridge is also located approximately 1,600 feet west of the ROW and Harvey Street intersection. It is important to highlight the bridge is located approximately 125 feet west of the municipal boundaries between the Town of Norton and City of Taunton (**Figure 2**).

## 2.1 Desktop Review for Resource Areas

Based on review of the MassDEP Wetland Maps for Bristol County, freshwater wetlands are mapped within and adjacent to the Site (**Figure 3**). MassDEP classifies the wetland complex mapped to the north and south of the bridge (as well as approximately 700 feet east of the bridge) as wooded swamp deciduous (WS1). The wetland mapped northwest of the bridge is classified as shrub swamp (SS) and the wetland mapped directly north of the Site is classified as deep marsh (DM).

Based on review of the National Wetland Inventory (NWI) Maps provided by the U.S. Fish and Wildlife Service (USFWS), freshwater wetlands are mapped with similar boundaries as the mapped MassDEP Wetlands (**Figure 4**). The wetland mapped to the north and south of the bridge is classified as riverine, lower perennial, unconsolidated bottom, permanently flooded (R2UBH). The wetland mapped northwest of the bridge is classified as palustrine, scrub-shrub, broad-leaved deciduous, seasonally flooded/saturated (PSS1E). The wetland mapped southwest of the bridge is classified as palustrine forested, broad-leaved deciduous, seasonally flooded/saturated (PFO1E). It is also important to note that east of the bridge is another wetland mapped as PFO1E that is located adjacent to the railroad ROW.

According to the Natural Resources Conservation Service[2] soil survey for Bristol County, the Site is mapped as Freetown muck, 0-1% slopes (52A) (**Figure 5**). Immediately west of the Site, the soil is mapped as Windsor loamy sand, 3-8% slopes (255B) and to the east of the Site, the soils are mapped as Windsor loamy sand, 8-15% slopes (255C).

The most recently issued Flood Insurance Rate Map[3], produced by the Federal Emergency Management Agency (FEMA), indicates that the Site lies within the 100-year floodplain (**Figure 6**). The Site is mapped as Zone A, which is the 1% annual chance of flooding with no base flood elevation provided (**Figure 6A**). According to the Flood Insurance Study (FIS) performed for Bristol County and the Threemile River, the base flood elevation was not provided within the Site or in proximity to the Site within the FIS[4]. The FIS' northernmost/most upstream portion of Threemile River extends to Tremont Street (just west of the intersection with Route 140/Alfred Lord Boulevard); which is still approximately 2 miles south from the Site. After further investigation detailed in the Hydraulic Analysis (**Attachment E**), the 100-year floodplain elevation was measured at Threemile River to be 55.51 feet above mean sea level (msl). This elevation is well below the proposed embankment/ballast widening. The bottom of the bridge's steel girders are at 60.02 feet msl, with the top of track rail at 65.68 feet msl on the western abutment and 66.18 feet msl on the eastern abutment. Therefore, the Project is not anticipated to impact the 100-year floodplain/Bordering Land Subject to Flooding (BLSF) under the WPA (MGL Chapter 31, Section 40).

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[2] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Accessed August 31, 2020.

[3] Federal Emergency Management Agency, National Hazard Flood Layer, Digital Flood Insurance Rate Map. Map 25005C0134F. Effective 7/7/2009. Accessed August 31, 2020.

[4] Federal Emergency Management Agency, Flood Insurance Study Number 25005CV002B, December 21, 2012.

According to the most recently available data provided by the Massachusetts Natural Heritage and Endangered Species Program[5] (NHESP), a Priority Habitat of Rare Species (PH 669) and Estimated Habitat of Rare Wildlife (EH 551) are mapped immediately to the east and south of the bridge (**Figure 7**). Underneath the WPA, this resource is labeled as Estimated Habitats of Rare Wildlife (310 CMR 10.59). There are no mapped certified or potential vernal pools located within the Site. There is however a certified vernal pool (CVP) located approximately 550 feet east of the bridge (CVP 7082). This CVP was certified on July 10, 2013 and includes presence of obligate species (fairy shrimp). There are also two mapped potential vernal pools (PVP) located near the Site. The first PVP is located approximately 575 feet east of the bridge (PVP 24997); 25 feet north of the CVP. The second PVP is located approximately 730 feet east of the bridge (PVP 24996); adjacent to the southwestern corner of the residential backyard on Brandy Lane.

The entire Site and ROW is located within an Area of Critical Environmental Concern[6] (ACEC 29) and is labeled as the Threemile River Watershed. The ACEC was designated on 8/25/2008, includes 14,275 acres within the Town of Norton and City of Taunton and is administered by DCR. According to MassDEP, the Site is not mapped or located near an area designated as an Outstanding Resource Water[7] (ORW). The Site is not located within a Zone I, II or Interim Wellhead Protection Area[8] (**Figure 8**).

## 2.2 Wetland and Waterbody Resources

Jacobs Wetland Scientists delineated the Site on January 23, 2020 in accordance with methods developed by MassDEP[9] and the U.S. Army Corps of Engineers[10] (USACE). A total of two wetlands and one perennial stream were delineated within or adjacent to the Site. The WPA resource areas identified within or near the Site include Bank, Bordering Land Subject to Flooding (BLSF), Bordering Vegetated Wetland (BVW), Land Under Water Bodies and Waterways (LUWW) and Riverfront Area. These resources are defined under the WPA as follows;

- **Bank:** As defined in 310 CMR 10.54(2)(a), is defined as "the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and an upland."
- **Bordering Land Subject to Flooding (BLSF)**: As defined in 310 CMR 10.57(2)(a), is "an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. It extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland."
- **Bordering Vegetated Wetlands (BVW)**: As defined in 310 CMR 10.55(2)(a), are "freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants."

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[5] Massachusetts Natural Heritage and Endangered Species Program, Oct. 2017. Massachusetts Natural Heritage Atlas. 14th Edition.

[6] MassGIS (collaboration with DCR and CZM), Sept. 2017. Massachusetts ACECs.

[7] MassGIS, Dec. 2017. Designated Outstanding Resource Waters of Massachusetts.

[8] MassGIS, Oct. 2017. Approved Wellhead Protection Areas (Zone I, II and IWPAs).

[9] DEP, 1995. Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act.

[10] USACE, 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0.

- **Land Under Water Bodies and Waterways (LUWW)**: As defined in 310 CMR 10.56(2)(a), is "the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock."
- **Riverfront Area:** As defined in 310 CMR 10.58(2)(a), is "the area of land between a river's mean annual high water line and a parallel line measured horizontally."

A total of two BVWs and one perennial stream (Threemile River) were delineated within or adjacent to the Site. One BVW, Wetland 1/1A was delineated immediately to the north and south of the bridge. The other BVW, Wetland 2 was delineated to the east of the bridge, between the bridge and Harvey Street along the northern toe-of-slope of the railroad (this BVW was delineated approximately 890 feet west of the railroad and Harvey Street intersection). The main portion of Threemile River (Perennial Stream 1) was delineated along both the western and eastern Banks that were both observed to continue underneath the bridge. To the northwest of the bridge is a small tributary to the main portion of Threemile River, in which the Banks (northern and southern) were also delineated (**Attachment A**).

### 2.2.1 Wetland 1/1A

Wetland 1/1A was delineated southwest, southeast and northeast of the bridge, and was observed to extend both northward and southward outside the limits of the Site. Wetland 1 was delineated southwest of the bridge and was observed to begin along the toe-of-slope of a steep forested slope and continue eastward until ultimately draining directly into Perennial Stream 1. Wetland 1A was delineated both southeast and northeast of the bridge.

The southeastern portion of Wetland 1A, similar to Wetland 1, was observed to have the wetland/upland boundary originate at the toe-of-slope of a steep slope. However, Wetland 1A was observed to continue westward, draining directly into the eastern Bank of Perennial Stream 1.

The northeastern portion of Wetland 1A was observed in a depression area located northeast of the bridge and was also observed to drain directly into the eastern Bank of Perennial Stream 1. Wetland 1 was observed to be predominantly vegetated with swamp white oak (*Quercus bicolor*), silver maple (*Acer saccharinum*), red osier dogwood (*Cornus alba*) and tussock sedge (*Carex stricta*). Hydrological indicators of wetland conditions included approximately 2" of inundation, high water table, saturation, sediment deposits, inundation visible on aerial imagery, sparsely vegetated concave surface, water-stained leaves, thin muck surface, surface soil cracks, drainage patterns, saturation visible on aerial imagery and microtopographic relief. Soils were observed to be an organic muck in the A-horizon with a 10YR 2/1 matrix color (0-7") and a silty clay loam in the B-horizon with a 10YR 4/1 matrix (70%) and 10YR 4/3 mottle (30%) color (7-24"). Soils were observed to meet both the sandy mucky mineral (S1) and the depleted matrix (F3) hydric soil criteria.

### 2.2.2 Wetland 2

Wetland 2 was delineated east of the bridge, along the northern toe-of-slope of the ROW (approximately 900 feet west of Harvey Street) and was observed to extend northward outside the limits of the Site. Wetland 2 was observed to continue northward and was hypothesized with high confidence to ultimately drain into Perennial Stream 1 (Threemile River). Wetland 2 was observed to be predominantly vegetated with silver maple, red maple (*Acer rubrum*), silky dogwood (*Cornus amomum*) and sensitive fern (*Onoclea sensibilis*). Hydrological indicators of wetland conditions included approximately 1" of inundation, high water table, saturation, sediment deposits, water-stained leaves, thin muck surface, surface soil cracks, and drainage patterns. Soils were observed to be an organic muck in the A-horizon with a 10YR 2/2 matrix color (0-5") and a silty clay loam in the B-horizon with a 10YR 4/2 matrix (80%) and 10YR 4/4 mottle (20%) color (5-24"). Soils were observed to meet both the sandy mucky mineral (S1) and the depleted matrix (F3) hydric soil criteria.

### 2.2.3 Perennial Stream 1/1A

Perennial Stream 1/1A, was delineated along both the north and south sides of the ROW. PS1 flagging was placed along the western Bank, whereas, PS1A flagging was placed along the eastern Bank. Perennial Stream 1/1A is also known as Threemile River and was observed to flow southward, flowing underneath the bridge and continuing to flow in a southeast direction. During the time of delineation, approximately one foot of surficial flow was observed flowing under the bridge and the mean annual high water (MAHW) line was flagged along the Bank. There was also observed to be a tributary that flowed into the main channel of Threemile River and is located northwest of the bridge; a smaller perennial stream approximately three feet in width, four to six inches in depth, runs parallel to the toe-of-slope of the railroad, then abruptly turns north at delineation flag PS1-15 and continues northward outside of the survey area (**Attachment A**).

USACE Data Forms are attached documenting Jacobs observations of each data point taken; one for each wetland (DP#) and one for the upland area adjacent to the wetland (UPDP#) (**Attachment B**). Representative photographs (**Attachment C**) have also been taken of the Site to depict existing conditions.

### 2.2.4 100-foot Buffer Zones and 200-foot Riverfront Area

The WPA establishes 100-foot buffer zones extending from resources, including BVW and Bank. The WPA states that any activities that are undertaken within 100 feet of an area specified in 310 CMR 10.02(1)(a) (e.g. BVW) will be conducted per 310 CMR 10.02(2)(b), "*in a manner so as to reduce the potential for any adverse impacts to the resource area during construction, and with post-construction measures implemented to stabilize any disturbed areas.*" Work will be conducted from the existing railway embankment, which is considered a disturbed habitat. Per 310 CMR 10.02(2)(b)(1) of the WPA, erosion and sediment controls will be placed prior to the start of work within the 100-foot buffer zone to BVW or adjacent to the Banks (whichever is the greater lateral extent) to avoid adverse impacts to adjacent resource areas.

The WPA also establishes a 200-foot Riverfront Area for Perennial Stream 1, denoted by the MAHW line/Bank delineated in the field.

# 3. Project Description

The Project proposes to replace the bridge to prevent future safety conditions that may impact the movement of freight trains through the Site and a potential disruption of service. In addition to the bridge replacement, the Project also proposes to widen the existing embankment/ballast. The Project will work upgradient from the installed erosion and sediment controls and carefully place additional ballast to widen the footprint of the track bed.

After Project completion, the straw wattles and silt fence will be carefully removed and then immediately reseeded with a fast germinating erosion control seed mix[11], covered with a biodegradable erosion control blanket (preferable coir material) and properly staked (**Attachment D**).

Primary construction access for the Project will be along the existing railroad (hi-rail) with public access at Harvey Street. Temporary staging areas required to perform the work are located within the ROW and outside wetland areas. Silt fence and straw wattles/coir logs will surround the downgradient portions of the staging areas. Access roads and staging areas will avoid sensitive resource areas. All areas temporarily disturbed for the purposes of construction access and staging will be restored to meet federal and state resource protection performance standards.

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[11] New England Wetland Plants, Inc., 820 West Street, Amherst, MA 01002, www.newp.com - New England Erosion Control/Restoration Mix For Detention Basins and Moist Sites.

The Project, as proposed, involves work that will occur in Riverfront Area, as well as the 100-foot buffer zone to BVW and Bank. Impacts to these resources are associated with establishment of the erosion and sedimentation controls, as well as the widening of the existing track embankment/ballast. The work proposed within the Riverfront Area will occur in areas that have previously been altered and degraded.

Although exempt from the WPA, Jacobs performed a hydrologic and hydraulics study to investigate the impact of the proposed Project on BLSF. The hydraulic analysis defines the base flood elevation and provides that the calculated proposed conditions model are equal to those calculated by the existing conditions model. Therefore, the proposed Project will not impact Threemile River base flow elevations in the vicinity of the Project Site. A copy of the analysis can be found in **Attachment E**. Again, it is critical to highlight this work is exempt from the WPA, but is being provided to have full transparency of what will be provided to MassDEP for the WQC Application.

## 3.1 Summary of Impacts

Impacts to environmental resource areas within the Town of Norton municipal boundaries are quantified in **Table 1** and the total Project impacts are provided in **Table 2**.

**Table 1 – Impacts within Town of Norton**

| Resource Area | Total Impact Area ($ft^2$) | Permanent Impact ($ft^2$) | Temporary Impact ($ft^2$) |
|---|---|---|---|
| 100-foot Buffer Zone | 7,047 | 5,365 | 1,682 |
| 200-foot Riverfront Area | 7,681 | 5,999 | 1,682 |

**Table 2 – Impacts for Entire Project**

| Resource Area | Total Impact Area ($ft^2$) | Permanent Impact ($ft^2$) | Temporary Impact ($ft^2$) |
|---|---|---|---|
| 100-foot Buffer Zone | 14,027 | 10,880 | 3,147 |
| 200-foot Riverfront Area | 15,615 | 12,468 | 3,147 |

The Project was designed to avoid impacts to wetlands and other sensitive environmental resource areas. More detail on impact minimization is provided in Section 5.

## 3.2 Alternatives Analysis

Three alternatives to the proposed activities were investigated for the proposed Project, including the no build, relocation of existing track to a new adjacent alignment, and, abutment stabilization. The analysis determined that there are no practical alternatives which do not involve excavation of wetlands or discharge of fill material. Two alternatives were considered but rejected because they 1) do not achieve the purpose of the Project, and/or 2) do not minimize discharge of fill materials to wetlands and waterbodies. The selected scope of work includes appropriate and practicable steps to minimize potential adverse impacts to sensitive resource areas, while accomplishing the Project goal of addressing an ongoing safety condition.

### 3.2.1 No Build

The no build alternative assumes that no replacement of the bridge will occur, and the existing conditions will remain. Currently the bridge has not failed, however continued deterioration may allow for the stone abutments to continue to crack, falling into the stream channel and no longer providing safe passage over the stream for freight trains. In addition, the track embankment remains both before and after the bridge, leaving the potential for the side slopes to erode. The no build alternative is not practicable because if no action is taken, the continued failure of the bridge and abutments constitutes a safety hazard. Continued deterioration may also affect the track geometry in this area by pushing the embankment towards the stream channel, embankment failure and create a potential derailment situation.

### 3.2.2 Relocation of Existing Track and Railbed

This alternative proposes the relocation of the existing track and railbed to an alternate, adjacent alignment within the Project area. This would require complete reconstruction and associated ground disturbance necessary to relocate the railbed slightly to the north or south. This would include complete rebuilding of the railroad embankment; including filling wetlands adjacent to the Threemile River. Relocation of the track and embankment would not completely resolve the existing condition of the bridge, as the bridge would still need to be replaced.

In addition, movement of the tracks may create an unstable condition by shifting weight on the underlying substrate away from the more stable existing alignment. Moving the alignment towards the inner or outer edges of the ROW would need to have the new embankment constructed, compacted and tested. The new embankment would likely encounter settling over time, as it would be newly constructed and hasn't experienced compaction over decades of service like that of the current alignment. Realignment of the track to the south would also increase the curvature of the track in this area, creating a greater chance of derailment and a less safe track condition. With a realigned track, there would be an increased risk in rail equipment falling off the established embankment and into wetlands adjacent to the Threemile River.

### 3.2.3 Abutment Stabilization

This alternative would propose the construction of retaining walls directly north and south of the existing stone abutments. These would reinforce the deteriorating stone abutments located on the western and eastern Banks of Threemile River. This alternative would require clearing and grubbing around the abutments, excavation within BVW and LUWW to secure the toe of the retaining walls, backfill the installed retaining wall with rip rap to provide additional support. Even after all of this support and filling in WPA resources, this alternative fails to accomplish the Project purpose, as the deteriorating girders and ties of the existing bridge remain. This alternative would also require extensive widening of the existing track embankment/ballast and would propose significant fill/permanent impacts to both BVW and Perennial Stream 2 to safely establish the new embankment toe-of-slope. In addition, the potential for catastrophic failure still exists and therefore this alternative was deemed impracticable.

# 4. Regulatory Compliance

The Project is believed to be characterized as a *Limited Project*, underneath 310 CMR 10.53(3)(l), which states "the construction, reconstruction, operation or maintenance of water dependent uses; provided, however that: 1. any portion of such work which alters a bordering vegetated wetland shall remain subject to the provisions of 310 CMR 10.55, 2. such work in any other resource area(s) found to be significant to flood control or prevention of storm damage shall meet the performance standards for that interest(s), and 3. adverse impacts from such work in any other resource area(s) shall be minimized regarding the other statutory interests for which that resource area(s) is found to be significant." These types of projects may be permitted as long as they will have any no adverse effect on specified habitats site of Rare Species, the availability of reasonable alternatives to the proposed activity, the extent to which adverse impacts are minimized, and the extent to which mitigation measures are provided contribute to the protection of the WPA; the Project is believed to meet this criteria as further discussed below.

## 4.1 Massachusetts Wetlands Protection Act

As proposed activities for the Project take place in both the municipal limits of the Town of Norton and City of Taunton, NOIs are being filed with both the Norton Conservation Commission and Taunton Conservation Commission. Following the impact tables provided in **Attachment A**, the impacts to WPA resources are further broken up by individual municipality.

As described in 310 CMR 10.00(2), the purpose of the WPA is to provide for the protection of the following eight interests of the Act;

1) *Protection of public and private water supply*: The Project is proposing to implement best management practices (BMPs) for the proposed activities. These BMPs will minimize the potential for the migration of sediment and sediment-laden runoff from draining into wetlands and waterbodies located within and near the Site. The BMPs are also intended to prevent erosion of soil. Therefore, no adverse impacts to public or private water supplies are anticipated as a result of the proposed Project.

2) *Protection of ground water supply*: This Project is not anticipated to impact groundwater resources as no known ground water supply wells exist within or near the Site. As described above, BMPs will be employed to minimize adverse impacts to surface waters (and consequently, no adverse impacts to the ground water as well).

3) *Flood control*: The 100-year floodplain is located within the Site and as the WPA exempt replacement of the bridge abutments will temporarily work below the base flood elevation, but not permanently impact or reduce flood storage capacity, the Project is not anticipated to result in negative impacts to flood control structures or the storage of flood flows. The replacement of the abutments will provide positive impacts to this watershed by addressing a deteriorating condition that could harmfully impact the stream and floodplain.

4) *Storm damage prevention*: The proposed work is not anticipated to impact wetlands that provide value for storm damage prevention. The proposed work will be limited to the 100-foot buffer zone and Riverfront Area. The proposed Project will provide more resilient conditions than those that currently exist, increasing the track embankment and bridge's longevity to survive storm surges.

5) *Prevention of pollution*: The proposed work is not anticipated to negatively impact wetlands that currently provide value for prevention of pollution or contaminant attenuation. The impacts proposed are only to the 100-foot buffer zone (no proposed BVW or waterbody impacts) and is associated with the reestablishment of the track embankment, as well as replacement of abutments and required as part of the Project. BMPs will be employed during the Project to minimize the potential for adverse impacts to the water quality of wetlands and waterbodies.

6) *Protection of land containing shellfish*: No land or areas containing shellfish will be impacted by this Project.

7) *Protection of fisheries*: BMPs will be in place to prevent migration of sediment, erosion of existing soil, and sediment-laden runoff from draining into wetlands and waterbodies. There are no known fisheries within or adjacent to the Site and it is also important to note that this portion of Threemile River is not a designated cold water fisheries resources or has the presence of anadromous fish. Therefore, fish species are not expected to be impacted by the Project.

8) *Protection of wildlife habitat*: Given that the work will occur in the previously disturbed and maintained ROW of the railroad, no substantial impacts are anticipated to occur to wildlife habitats. These impacts will not segment habitat, as they occur on the edge of the gravel and ballast embankment. Therefore, the Project is not anticipated to negatively impact wildlife habitat.

In addition to the main eight interests of the WPA, there are also performance standards associated with the following WPA resources;

- **310 CMR 10.54(4) Bank:** The Project and proposed activities will remain within the established ROW. As the bridge will be replaced in-kind, behind the existing abutments, and the track embankment widened within the maintained ROW, no permanent impacts to Bank are proposed. Although exempt from the WPA, the bridge replacement will be performed in compliance with the *Massachusetts River and Stream*

*Crossing Standards*[12] and the *USACE Stream Crossing Best Management Practices*[13], as detailed in Section 4.2 below.

According to NHESP, only the easternmost portion of the Site (approximately 65 feet east of the bridge) and south of the Site (approximately 42 feet south of the bridge) is located within a mapped priority habitats of rare species and estimated habitats of rare wildlife. Proposed activities within this particular portion of the Site will remain within the confines of the ROW. A MESA Checklist for the Project was submitted to NHESP on December 28, 2020 (NHESP File No. 20-39827) and a response of the Project "will not result in a prohibited Take of state-listed rare species" was received on January 27, 2021 (**Attachment F**). As such, the proposed Project is not anticipated to result in a "take" of threatened or endangered species.

- **310 CMR 10.57(4) BLSF:** During the initial investigation of the Project, the Site was assessed for presence within the regulatory 100-year floodplain. The FEMA Map Service Center was utilized to make a determination based upon mapped boundaries. The Project does not involve a loss of flood storage volume, nor any restrictions of flows that would cause an increase in flood stage or velocity. Therefore, the Project is not anticipated to result in negative impacts to flood control structures or the storage of flood flows. The replacement of the structurally deficient bridge will provide positive impacts to this watershed by addressing a deteriorating condition that could harmfully impact the stream and floodplain.

- **310 CMR 10.53(4) BVW:** Wetland 1 and 1A were BVW resource areas delineated at two differing areas adjacent to Threemile River; Wetland 1 located southwest of the bridge and Wetland 1A located southeast and northeast of the bridge. No impacts to BVW are proposed with the Project. Approximately 7,047 square feet of 100-foot buffer zone will be impacted (5,365 square feet permanently) by the Project. Included in this total calculation, approximately 1,682 square feet of the 100-foot buffer zone will be temporarily impacted by placement of soil erosion and sediment controls and access for the construction of the Project.

- **310 CMR 10.58 (4) Riverfront Area:** The Project does not involve a change in use and will remain within the limits of the established ROW. The widening of the track embankment is considered a Redevelopment of a Previously Developed Riverfront Area per 310 CMR 10.58(5), as the work consists of an improvement to an existing transportation structure. The Site is classified as a previously developed Riverfront Area, as it contains areas degraded prior to August 7, 1996 by gravel/ballast surfaces proposed within the Riverfront Area will not result in an increase of degraded or disturbed areas, as the ROW is already disturbed and maintained.

  The proposed work does not cause a significant adverse impact and conforms to the criteria found at 310 CMR 10.58(4)(d)(1)(a-d), as *alteration of up to 5000 square feet or 10% of the riverfront area within the lot, whichever is greater, on a lot recorded on or before October 6, 1997 or lots recorded after October 6, 1997 subject to the restrictions of 310 CMR 10.58(4)(c)2.b.vi., or up to 10% of the riverfront area within a lot recorded after October 6, 1997.* The proposed Project is located on ROW owned by the Commonwealth of Massachusetts prior to October 1997.

  The Project is not proposing any new stormwater management systems. The Project will retard the deteriorating embankment and bridge and contain exposed soils beneath a riprap stone structural feature, thereby trapping soil particles in place and preventing further erosion and sediment from into adjacent waterways. For additional details pertaining to stormwater, refer to **Attachment D**.

---

[12] *Massachusetts River and Stream Crossing Standards*. March 1, 2011. River and Stream Continuity Partnership (original March 1, 2006).

[13] USACE New England District. *Stream Crossing Best Management Practices (BMPs)*. January 2015.

Per the WPA performance standards within 310 CMR 10.58(4)(b), the Project is not anticipated to adversely impact areas designated as either Estimated Habitats of Rare Wildlife or Priority Habitats of Rare Species. The Project will require the removal of trees within the footprint of disturbance, to address existing conditions where danger trees are overhanging the track or are in an otherwise unstable structural condition that may create a hazard to passing trains and a potential disruption to service. The tree removal required is limited and will not cause segmentation of habitat, as the trees to be removed are located within the ROW adjacent to the railroad. Removal of these trees will be at the discretion of the Resident Engineer.

Per the performance standard at 310 CMR 10.58(4)(c), practicable and substantially equivalent economic alternatives have been investigated and the Project does not have a practicable alternative as the railroad track cannot be relocated to a different alignment outside of the ROW and away from the deteriorating bridge and associated raised embankment. Shifting the railroad track would not address the purpose of the Project, the need to stabilize the currently deteriorating condition, which, left in its present condition, would continue to fail and may eventually fail, disrupting service and creating a safety hazard for movement of equipment. Proposed conditions will improve the existing conditions, resulting in safer conditions and reduction of sediment load into existing waterways to the greatest extent practicable, thereby providing an upgrade of the existing conditions.

## 4.2 Stream Crossing Standards and BMPs

Although the bridge replacement is exempt from the WPA, it is important to highlight to the Conservation Commission that the proposed Project will meet the criteria described in the *Massachusetts River and Stream Crossing Standards* and the *USACE Stream Crossing Best Management Practices*, as the replacement bridge will be three-sided, open bottomed, meet the openness requirements and the stream will continue to have a natural streambed substrate with sufficient headroom for wildlife passage. The Bank located adjacent to the bridge will continue to match the horizontal profile of the existing stream. The replacement bridge has been designed to prevent any future flooding of the area. The precast bridge will not constrict the flow, as the opening is larger than the existing bridge. It is also important to highlight that the design also meets the width requirements of 1.2 times the bankfull width, as well as the openness requirements (openness ratio greater than 0.25 meters). The dimensions of the bridge have been enlarged to the maximum extent practicable without increasing downstream flooding, minimizing the impacts to the natural area upstream and downstream, as well as to also maintain existing conditions within the associated streambed.

## 4.3 Clean Water Act Section 404

As the bridge replacement will take place within jurisdictional Wetlands and Other Waters of the United States, it requires authorization under Section 404 of the Clean Water Act (CWA). The Project qualifies for Massachusetts General Permit (GP) Number 10 – Linear Transportation Projects Including Stream Crossings. As the Project does not propose greater than 5,000 square feet of cumulative temporary and permanent impacts to jurisdictional wetlands and waterbodies, the Project is eligible for a Self-Verification Form. Notification under General Condition 6 (Historic Properties) for Section 106 of the National Historic Preservation Act is ongoing. Similarly, notification under General Condition 10 (Federal Threatened and Endangered Species) for Section 7 of the Endangered Species Act is also ongoing.

## 4.4 Clean Water Act Section 401

Pursuant to Section 401 of the CWA and in accordance with the Massachusetts Surface Water Standards (310 CMR 9.00), an application for a WQC will be submitted to MassDEP for review and approval following resolution of this NOI (issuance of Order of Conditions).

## 4.5 Section 106 of the National Historic Preservation Act

The Site is not located within or adjacent to any buildings or properties listed on the State or National Register of Historic Places. However, as part of the Section 404, consultation will still occur underneath the Section 106 process.

# 5. Construction Mitigation Measures

The Project is depicted on the enclosed Site Plans within **Attachment A**. Construction will include establishment and installation of erosion control BMPs around the work area prior to Project activities. Site preparation work will include limited vegetation clearing and removal of select trees/shrubs at the direction of the Engineer.

## 5.1 Avoidance and Minimization Measures

Construction access for the proposed Project is anticipated to be based from the existing track and railbed by hi-rail mounted vehicles and other equipment. Prior to construction, Site preparation will include installation of soil erosion and sedimentation controls by hand preparation. The erosion control barrier will consist of straw wattles/coir logs and silt fence and extend from the ends of the limit of the work and protect wetland resources. Selective removal and pruning of trees and shrubs will be conducted by hand or via a mechanical brush cutter, at the direction of the Engineer. Removal of vegetation will be limited to areas of slope stabilization and areas required for safe movement of construction swing arms from the railroad embankment.

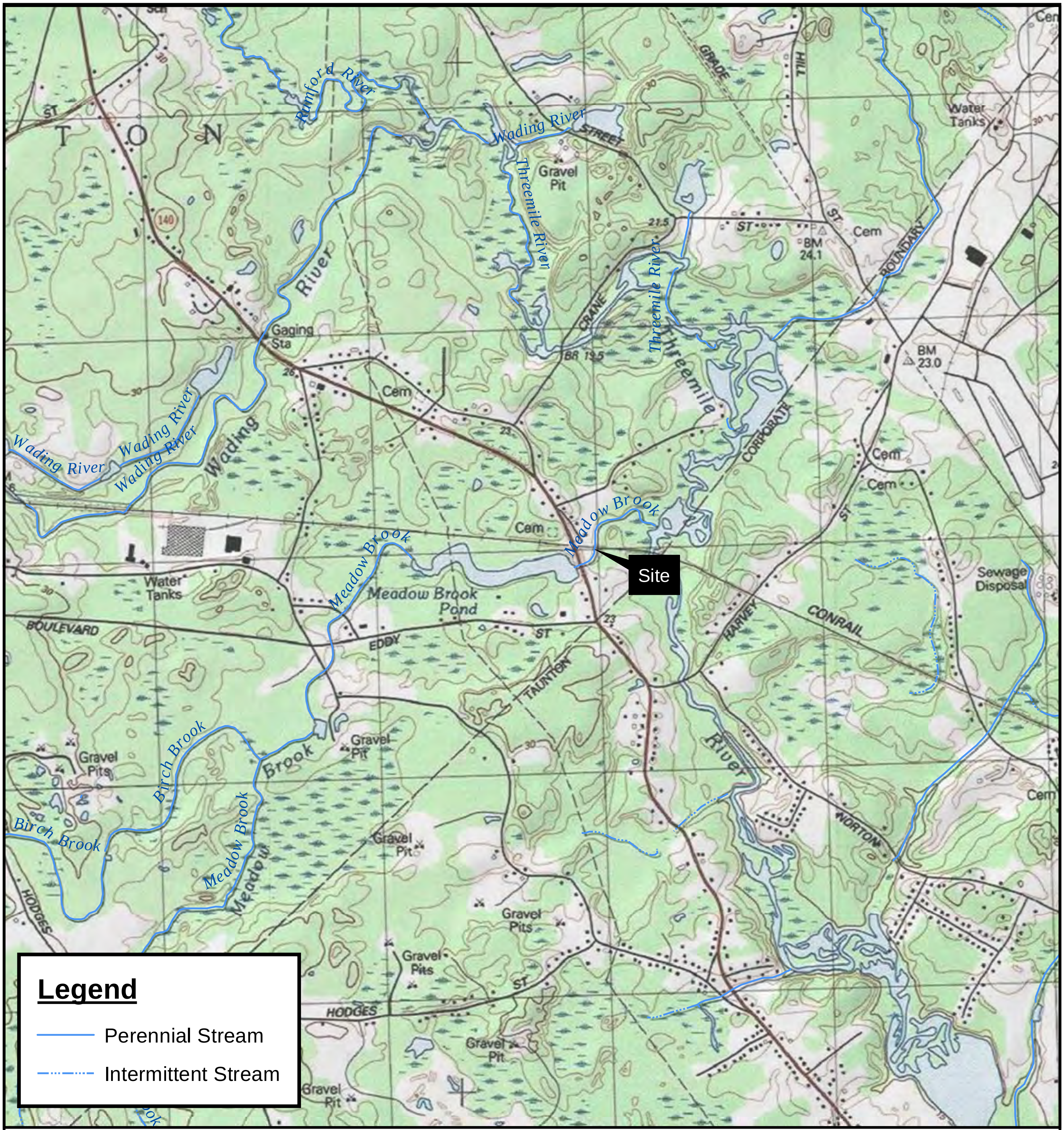
Slope stabilization work includes the use of hi-rail equipment to remove disturbed soils and associated vegetation. A layer of geotextile fabric will be laid down within the excavation where multiple layers of riprap will be deposited onto the fabric, up to the height of the wall and graded up to the tie-in with the existing slope at the back side of the excavation. Tamping of the riprap to provide additional support will occur between each layer. No loam will be added on top of the riprap slope as the restored soil material will, over time, be flushed into the void spaces and be washed away. The geometry of the existing railroad ditches will be restored to provide free flow from the wall and adjacent areas. Loaming and seeding of embankments at all disturbed areas within work limits will precede removal of soil erosion and sediment control BMPs.

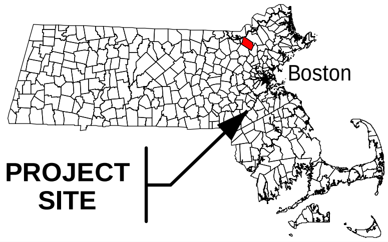
# 6. Summary

The design approach avoids WPA resource area impacts where feasible, and where unavoidable, minimizes impacts to the maximum extent practical through an extensive and thoughtful review and design process. On behalf of MassDOT, Jacobs respectfully requests that the Town of Norton Conservation Commission issue an Order of Conditions for the proposed Project.

# Figures

Location: \\BOSFIL11\Data2\NAI_proj\MASSDOT\2019\E2X83500\TASK 14 - Middleboro Bridge MP 6.84\600 Discipline Files\670 Environmental\GIS\Figure 1 - USGS Map.mxd





Source: MassGIS, Commonwealth of Massachusetts, Information Technology Division: USGS Tewksbury, MA 7.5 MinuteTopographic Quadrangles

N
W E
S

1 inch = 2,000 feet

2,000 0 2,000
Feet

**Prepared for:**
massDOT Massachusetts Department of Transportation Highway Division
**Prepared by:**
Jacobs

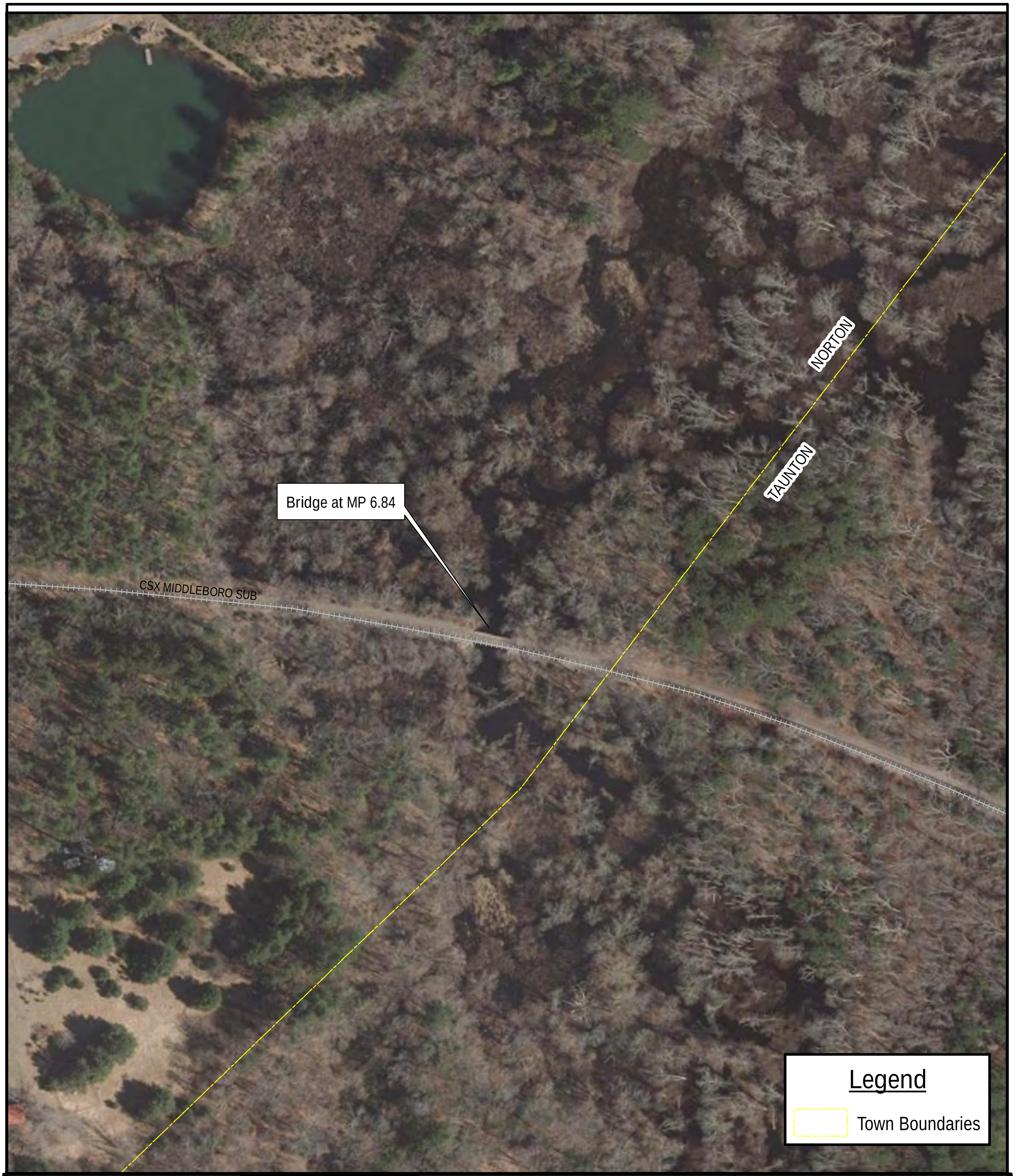
# FIGURE 1 - USGS MAP

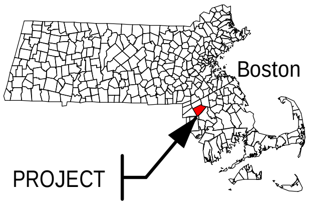
THREEMILE RIVER BRIDGE REPLACEMENT AT MILE POST 6.84
NORTON, BRISTOL COUNTY, MASSACHUSETTS

**NOV 2020**

**E2X83500**

Location: C:\Users\purdyk\Documents\ArcGIS\Packages\6.84_Norton_Figure_2_Aerial_KEM_400CB54A-6D47-4783-97E1-6374306D82E2\v107\6.84_Norton_Figure_2_Aerial_KEM.mxd





**Prepared for:**

massDOT

**Prepared by:**

Jacobs

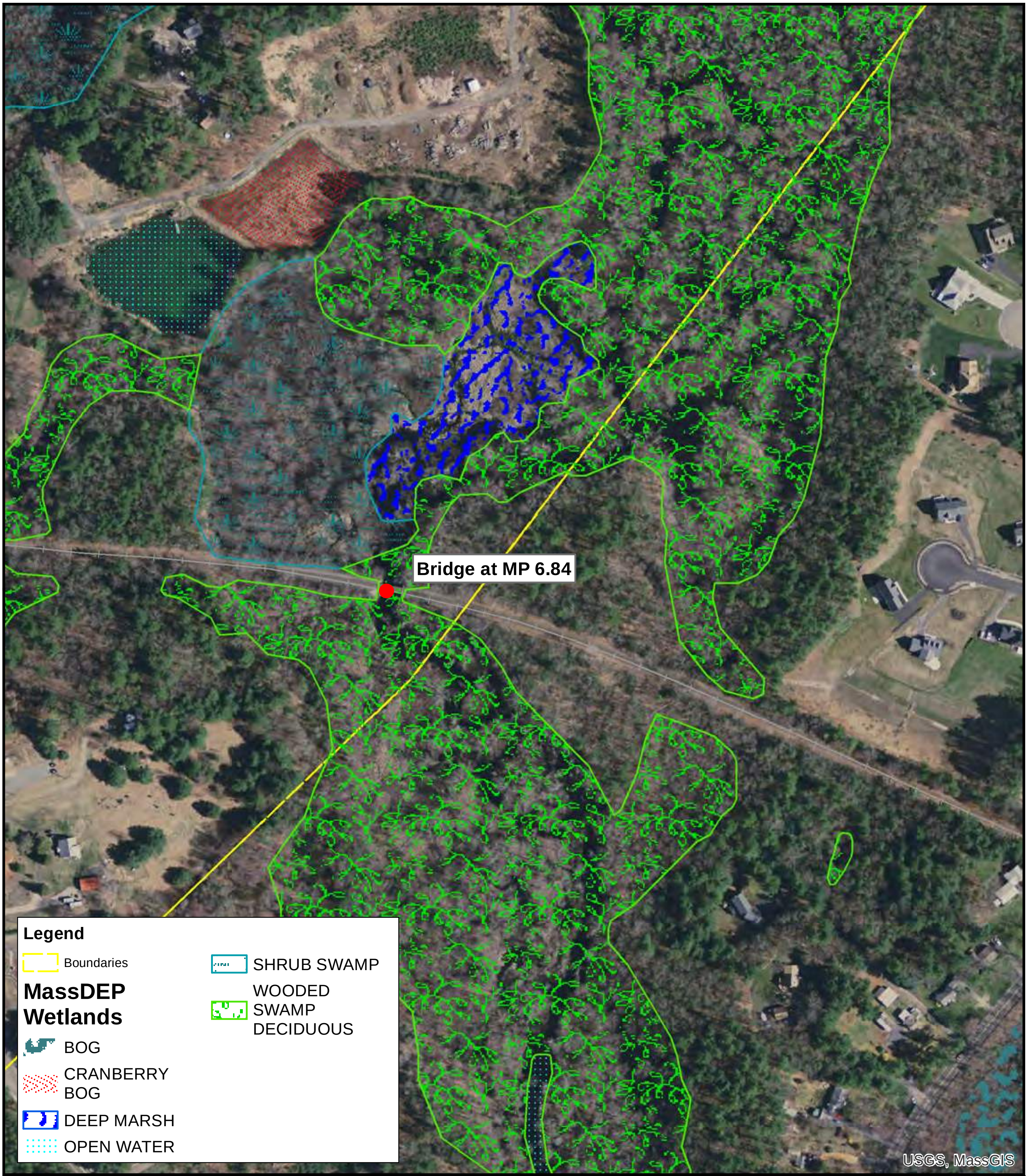
0 50 100 200

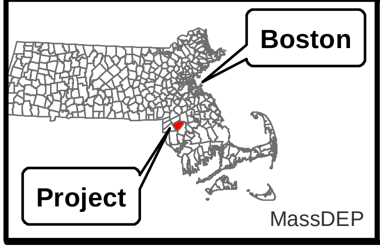
Feet

Data obtained from the MassGIS Sources:
Color Ortho Images, 2013/2014,

**THREEMILE RIVER BRIDGE**
**REPLACEMENT PROJECT**
**AT MP 6.84**
**NORTON, MA**

**Figure 2 - Aerial Map**





Prepared for:

massDOT

Prepared by:

Jacobs

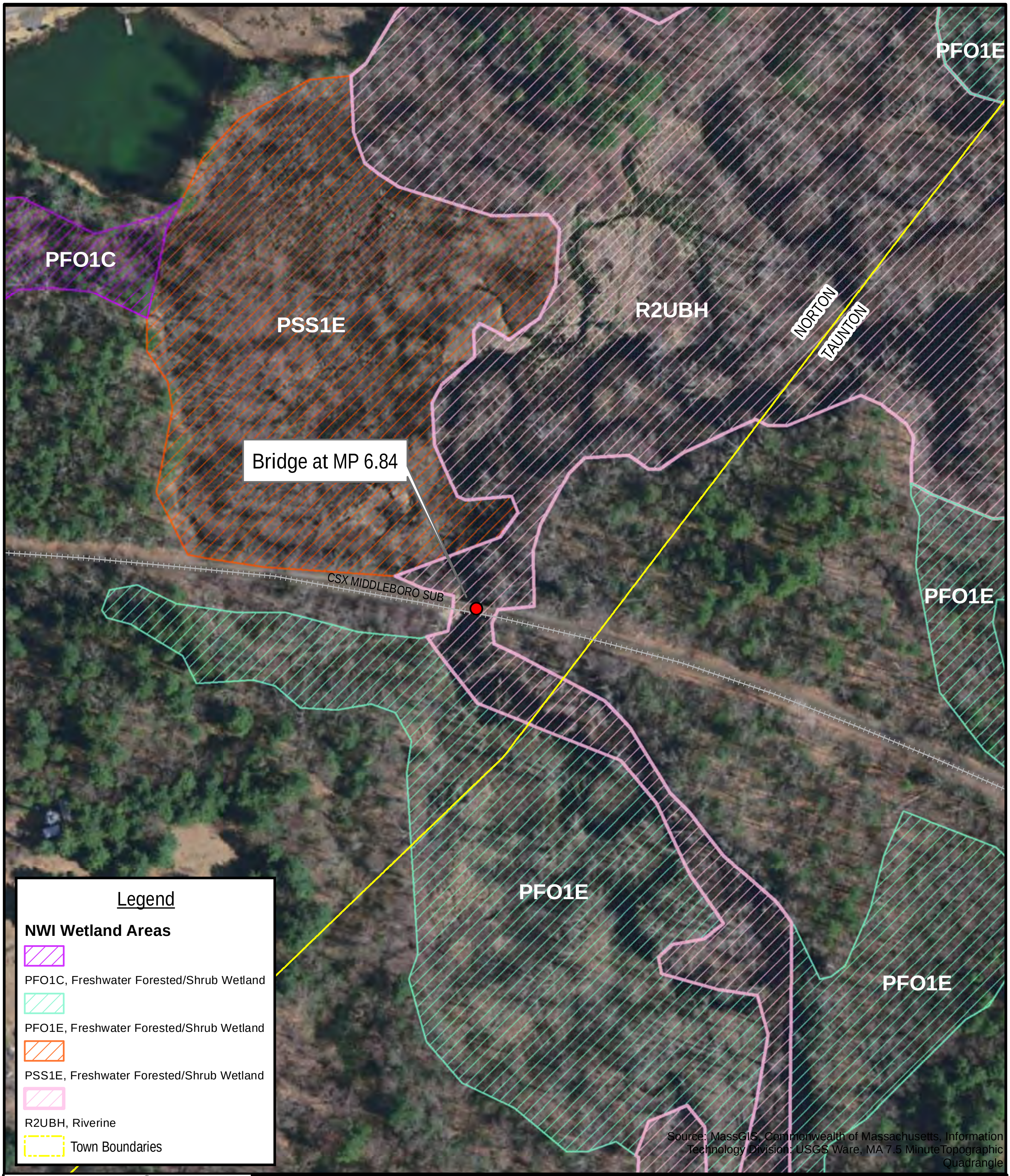
1 inch = 281 feet

0 90 180 360 Feet

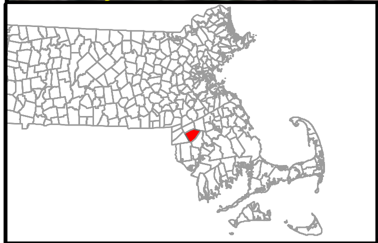
Data obtained from the MassGIS Sources:
Color Ortho Images, 2013/2014,
WETLANDSDEP_POLY,
WETLANDSDEP_ARC,

**THREEMILE RIVER BRIDGE REPLACEMENT PROJECT AT MP 6.84**
**NORTON, MA**

## Figure 3 - MassDEP Wetlands Map



Source: MassGIS, Commonwealth of Massachusetts, Information Technology Division; USGS Ware, MA 7.5 MinuteTopographic Quadrangle



**Prepared for:**

massDOT

**Prepared by:**

Jacobs

0 50 100 200 Feet

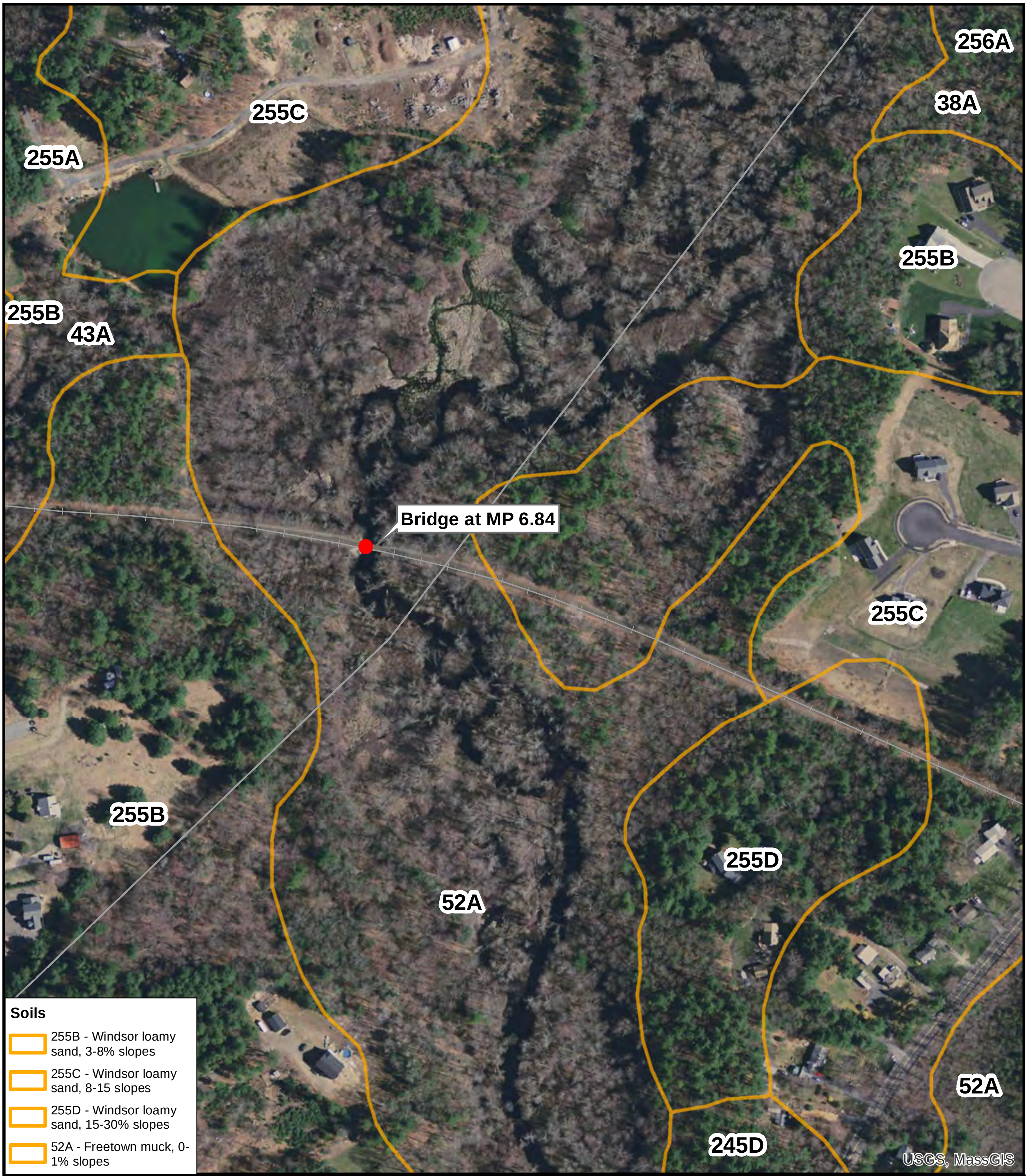
NOT TO SCALE

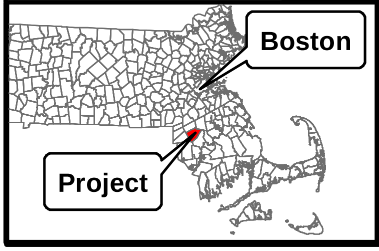
Data obtained from the MassGIS Sources:
Color Ortho Images, 2013/2014,
NWI_POLY

**THREEMILE RIVER BRIDGE REPLACEMENT PROJECT AT MP 6.84**
**NORTON, MA**

**Figure 4 - NWI Map**

Location: C:\Users\purdyk\Documents\ArcGIS\Packages\6.84_Norton_Figure_4_NWI_KEM_6B10B60B-7F50-4570-A6CB-4A8D4C46CBC0\v107\NWI_Wetlands_norton_KEM.mxd


256A
38A
255C
255A
255B
43A
255B
Bridge at MP 6.84
255C
255B
255D
52A
52A
245D
USGS, MassGIS
Soils
255B - Windsor loamy sand, 3-8% slopes
255C - Windsor loamy sand, 8-15 slopes
255D - Windsor loamy sand, 15-30% slopes
52A - Freetown muck, 0-1% slopes



Prepared for:

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Prepared by:

Jacobs

1 inch = 281 feet

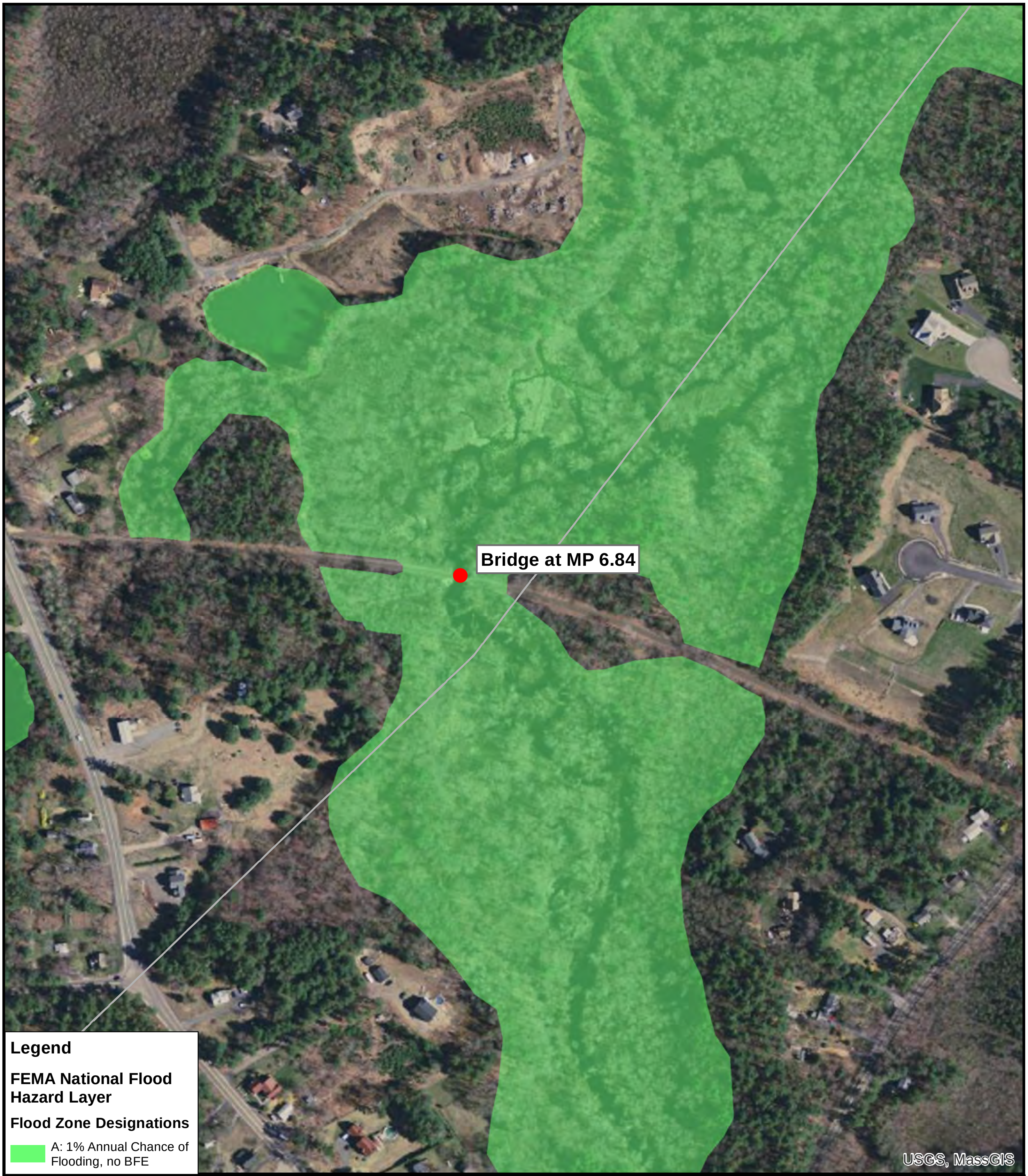
0 90 180 360 Feet

N

Data obtained from the MassGIS Sources: Color Ortho Images, 2013/2014, OPENSPACE_POLY, WETLANDSDEP_POLY, WETLANDSDEP_ARC, MHCINV_POLY, PVP_PT, PRIHAB_POLY, ESTHAB_POLY

**THREEMILE RIVER BRIDGE REPLACEMENT PROJECT AT MP 6.84**
**NORTON, MA**

**Figure 5 - Soils Map**

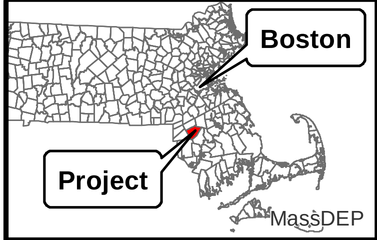


**Legend**

**FEMA National Flood Hazard Layer**

**Flood Zone Designations**

🟩 A: 1% Annual Chance of Flooding, no BFE



Prepared for:

massDOT

Prepared by:

Jacobs

1 inch = 337 feet

0 110 220 440 Feet

N

Data obtained from the MassGIS Sources: Color Ortho Images, 2013/2014, OPENSPACE_POLY, WETLANDSDEP_POLY, WETLANDSDEP_ARC, MHCINV_POLY, PVP_PT, PRIHAB_POLY, ESTHAB_POLY

**THREEMILE RIVER BRIDGE REPLACEMENT PROJECT AT MP 6.84**
**NORTON, MA**

**Figure 6 - FEMA Map**

## NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane mainland zone (FIPSZONE 2001). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov/.

**Base map** information shown on this FIRM was derived from digital orthophotography. Base map files were provided in digital form by Massachusetts Geographic Information System (MassGIS). Ortho imagery was produced at a scale of 1: 5,000. Aerial photography is dated April 2005.

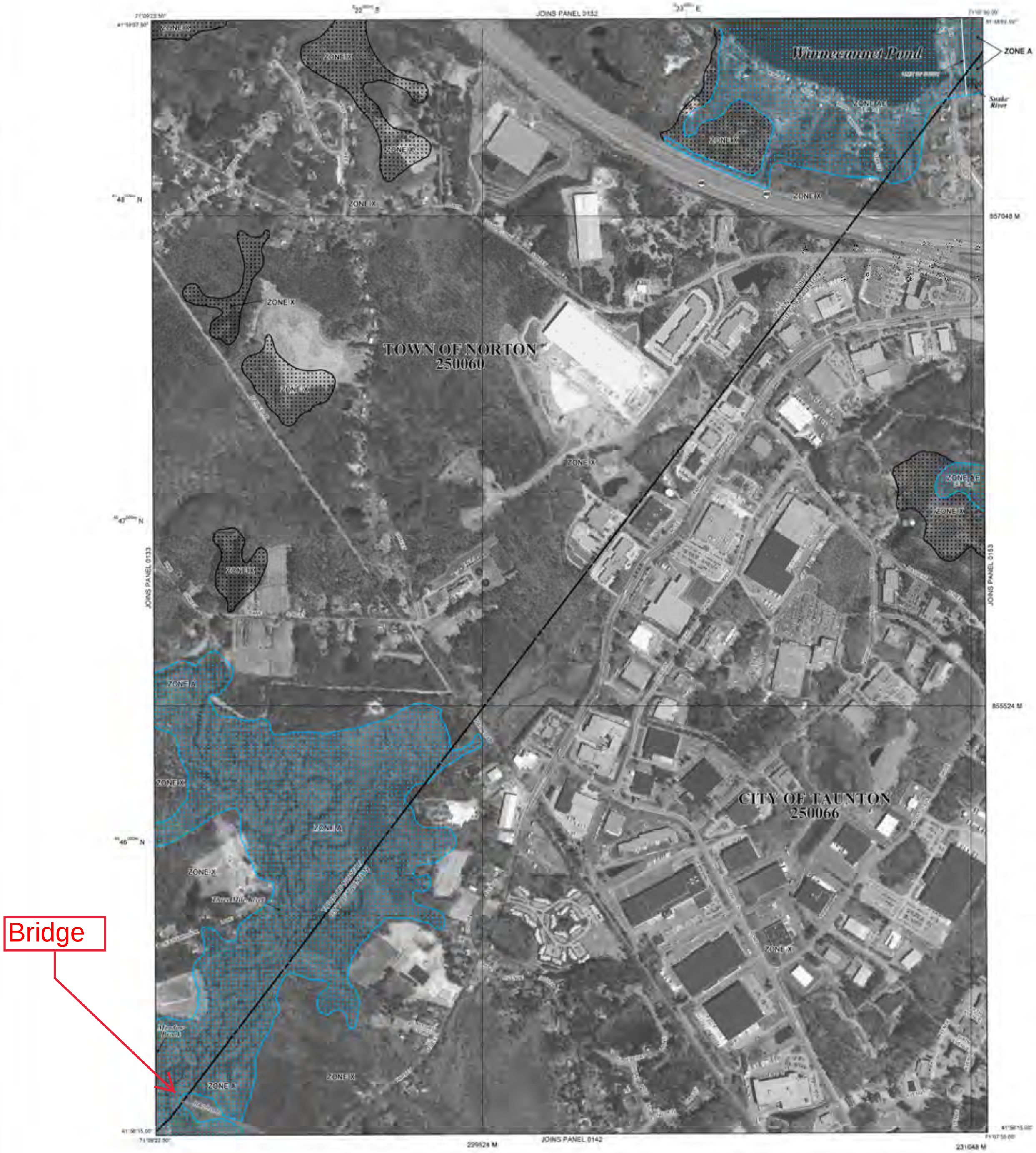
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a *Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



## LEGEND

▨ **SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

| | |
|---|---|
| ZONE A | No Base Flood Elevations determined. |
| ZONE AE | Base Flood Elevations determined. |
| ZONE AH | Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined. |
| ZONE AO | Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined. |
| ZONE AR | Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood. |
| ZONE A99 | Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined. |
| ZONE V | Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined. |
| ZONE VE | Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined. |

▨ **FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▨ **OTHER FLOOD AREAS**

| | |
|---|---|
| ZONE X | Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. |

☐ **OTHER AREAS**

| | |
|---|---|
| ZONE X | Areas determined to be outside the 0.2% annual chance floodplain. |
| ZONE D | Areas in which flood hazards are undetermined, but possible. |

▨ **COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

▨ **OTHERWISE PROTECTED AREAS (OPAs)**

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

| | |
|---|---|
| ——— | 1% annual chance floodplain boundary |
| ——— | 0.2% annual chance floodplain boundary |
| — — — | Floodway boundary |
| - —— —— - | Zone D boundary |
| ••••••••••••••••• | CBRS and OPA boundary |
| ▬ ← | Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities. |
| ~~~~ 513 ~~~~ | Base Flood Elevation line and value; elevation in feet* |
| (EL 987) | Base Flood Elevation value where uniform within zone; elevation in feet* |

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

| | |
|---|---|
| Ⓐ——Ⓐ | Cross section line |
| ㉓- - - -㉓ | Transect line |
| 97°07'30", 32°22'30" | Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) |
| ⁴²75⁰⁰⁰ᵐN | 1000-meter Universal Transverse Mercator grid ticks, zone 19 |
| [illegible] M | 6000-foot grid values: Massachusetts State Plane coordinate system, mainland zone (FIPSZONE 2001), Lambert Conformal Conic projection |
| [illegible] | [illegible] mark (see explanation in Notes to Users section of this FIRM panel) |
| • M1.5 | River Mile |

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
July 7, 2009
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

**MAP SCALE 1" = 500'**

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

**PANEL 0134F**

NATIONAL FLOOD INSURANCE PROGRAM

# FIRM
## FLOOD INSURANCE RATE MAP
## BRISTOL COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

**PANEL 134 OF 550**
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

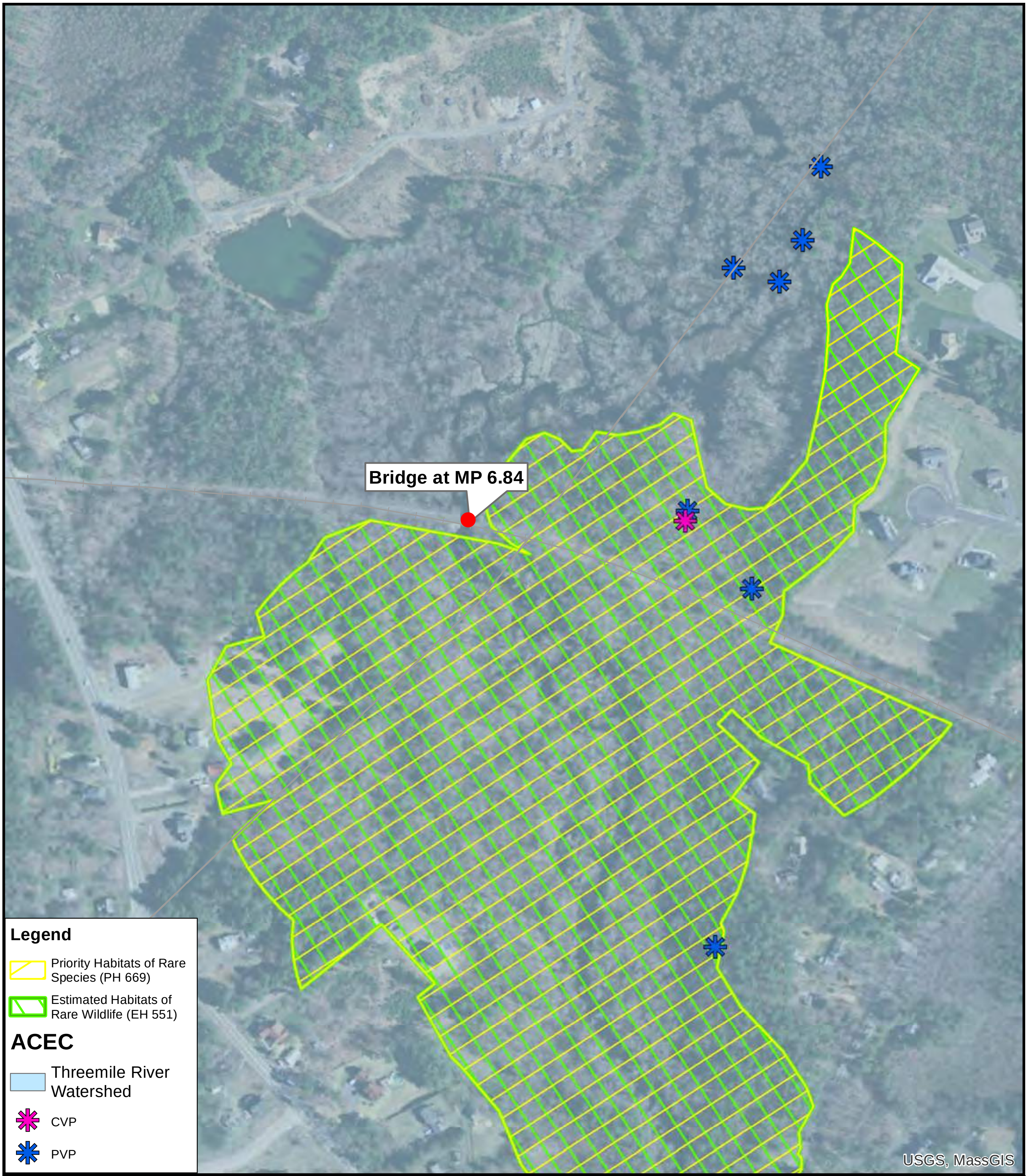
| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| NORTON, TOWN OF | 250060 | 0134 | F |
| TAUNTON, CITY OF | 250066 | 0134 | F |

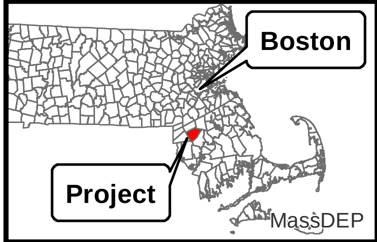
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

**MAP NUMBER**
**25005C0134F**

**EFFECTIVE DATE**
**JULY 7, 2009**

Federal Emergency Management Agency


Bridge at MP 6.84
Legend
Priority Habitats of Rare Species (PH 669)
Estimated Habitats of Rare Wildlife (EH 551)
ACEC
Threemile River Watershed
CVP
PVP
USGS, MassGIS



Prepared for:

Prepared by:

1 inch = 337 feet

Feet

0 105 210 420

Data obtained from the MassGIS Sources:
Color Ortho Images, 2013/2014,
OPENSPACE_POLY, WETLANDSDEP_POLY,
WETLANDSDEP_ARC, MHCINV_POLY, PVP_PT,
PRIHAB_POLY, ESTHAB_POLY

**THREEMILE RIVER BRIDGE
REPLACEMENT PROJECT
AT MP 6.84
NORTON, MA**

## FIGURE 7 - NHESP MAP

# Attachment A – Site Plans

# MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
# RAIL AND TRANSIT DIVISION

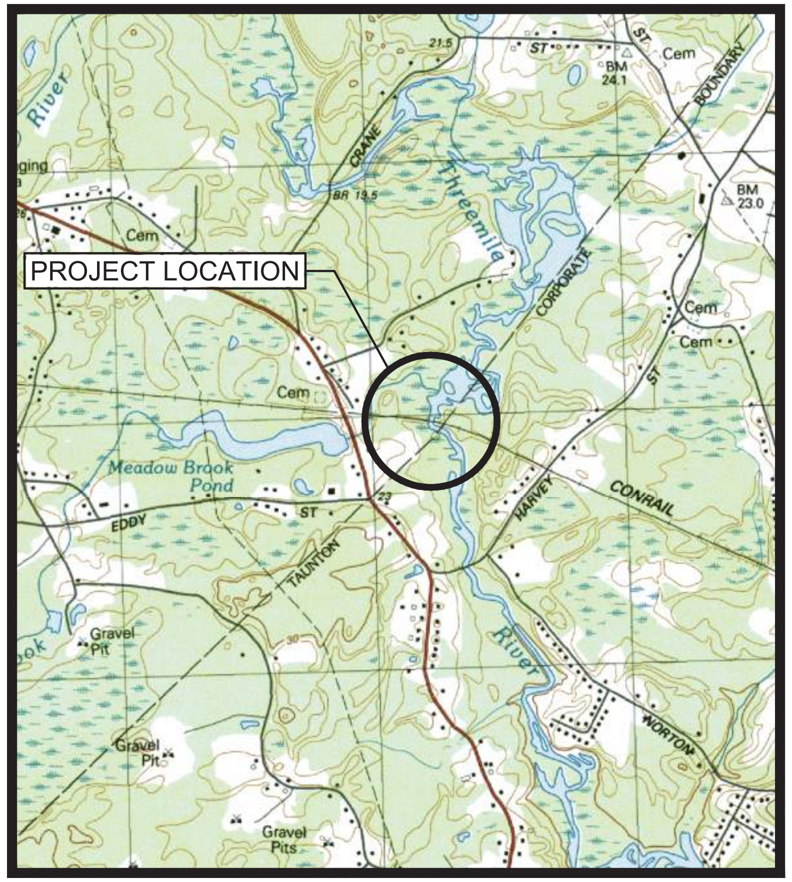
## MIDDLEBORO SUBDIVISION
## PROPOSED REPLACEMENT OF BRIDGE AT MILE POST 6.84

IN THE TOWNS OF

## NORTON AND TAUNTON
## BRISTOL COUNTY

### INDEX

SHEET NO. DESCRIPTION
1 TITLE SHEET AND INDEX
2 GENERAL NOTES
3 WETLAND AREA PLAN SHEET 1
4 WETLAND AREA PLAN SHEET 2
5 WETLAND AREA PLAN SHEET 3
6 WETLAND AREA PLAN SHEET 4
7 WETLAND AREA PLAN SHEET 5
8 DETAIL SHEET



LOCUS PLAN
SCALE: 1" = 2000'

0 2500 5000
SCALE IN FEET

PE STAMP:

JOHN J. WILSON
CIVIL
No. 54236

Massachusetts Department of Transportation
Rail & Transit Division

DATE:
March 23, 2021

MIDDLEBOROUGH SUBDIVISION
NORTON AND TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 1 OF 8

\\BOSFIL11\NAI_Proj\MASSDOT\2019\E2X83500\TASK 14 – Middleboro Bridge MP 6.84\700 CADD\711-ENVIR\MP 6.84 Notice of Intent.dwg March 23, 2021

DESIGN STANDARDS AND CODES OF PRACTICE

- AREMA MANUAL FOR RAILWAY ENGINEERING, 2015 EDITION
- DESIGN LOAD: COPPER E-80

VERTICAL ELEVATIONS: NAVD 88

COORDINATES: MASSACHUSETTS STATE COORDINATE SYSTEM NAD 83

DEWATERING PROCEDURES NOTES:

1. A TEMPORARY PIT WILL BE CONSTRUCTED TO DEWATER THE WORK AREA USING PIPE AND STONE FOR PUMPING EXCESSIVE WATER FROM EXCAVATIONS TO THE SUITABLE DEWATERING STRUCTURE AREA; A WELL VEGETATED UPLAND AREA LOCATED EAST OF THE BRIDGE.
2. A PERFORATED VERTICAL STANDPIPE WILL BE PLACED IN THE CENTER OF THE PIT AND SURROUNDED WITH A STONE SCREENING MATERIAL TO COLLECT FILTERED WATER. WATER IS THEN PUMPED FROM THE CENTER OF THE PIPE TO THE DEWATERING STRUCTURE AREA.
3. DISCHARGE OF TURBID WATER PUMPED FROM THE STANDPIPE SHOULD BE TO THE DEWATERING STRUCTURE, WHERE IT HAS A CHANCE TO FLOW THROUGH THREE LEVELS OF FILTRATION; SILTBAG, FILTER FABRIC, AND HAYBALES (SEE DETAIL FOR DEWATERING STRUCTURE).

CONSTRUCTION NOTES:

1. A TEMPORARY BARRIER WILL BE PLACED AROUND BOTH ABUTMENTS PRIOR TO DEMOLITION. THIS WILL PREVENT WATER FROM FLOODING THE WORK AREA SO THAT CONSTRUCTION CAN TAKE PLACE WITHOUT DISCHARGING SEDIMENT INTO THE WATER RESOURCE, AS WELL AS SECURELY INSTALL THE FOOTINGS OF THE NEW ABUTMENTS.
2. THE FOUNDATION AREA FOR THE PLACEMENT OF THE STRUCTURAL STEEL FRAMING AND THE IMPERVIOUS FABRIC MEMBRANE SHALL BE AS DIRECTED BY THE MANUFACTURER OR BY QUALIFIED PERSONNEL.
3. A MINIMUM OF 2 FEET OF FREEBOARD SHALL BE PROVIDED ABOVE THE EXPECTED HIGH WATER ELEVATION.
4. PARTICULAR ATTENTION SHOULD BE GIVEN TO THE FOUNDATION SUPPORT SYSTEM AT PERIMETER OF STRUCTURAL COMPONENT DAMS. ANY UNDERMINED OR SETTLED AREAS SHALL BE RESTORED IMMEDIATELY.
5. ANY HOLES, LEAKS, OR TORN AREAS IN THE GEO-MEMBRANES OR FABRIC SHALL BE REPAIRED IMMEDIATELY.
6. INSPECT THE INTERIOR DEWATERING SYSTEM AND ENSURE THAT THE SYSTEM IS DISCHARGING CLEAN WATER PRIOR TO RETURNING TO THE WATER RESOURCE.
7. REPAIR OR REPLACE ANY LOSS OF ROCK RIPRAP OR FILL THAT MAY OCCUR.
8. UPON COMPLETION OF THE CONSTRUCTION WORK, REMOVE ALL EXCESS MATERIAL, ACCUMULATED SEDIMENT AND DEBRIS FROM THE WORK AREA.

| | | | | |
|---|---|---|---|---|
| Jacobs | massDOT<br>Massachusetts Department of Transportation<br>Rail & Transit Division | DATE:<br>March 23, 2021 | MIDDLEBOROUGH SUBDIVISION<br>NORTON AND TAUNTON, MA | BRIDGE AT MP 6.84<br>SHEET 2 OF 8 |

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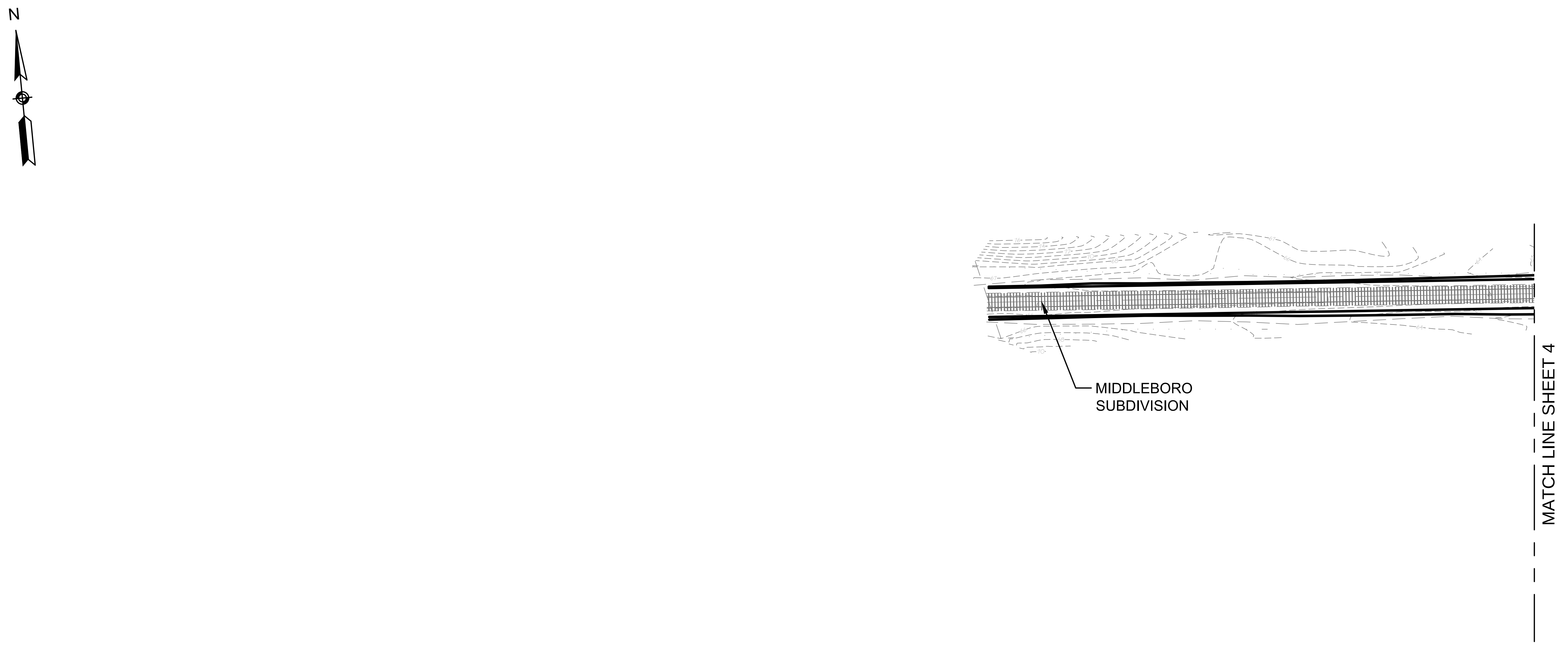

LEGEND

| | |
|---|---|
| W1-1 🟩 | BORDERING VEGETATIVE WETLAND (BVW) |
| 🟧 | 100-FOOT BUFFER ZONE TO BVW |
| PS1-1 🟦 | PERENNIAL STREAM (PS) |
| 🟪 | 200-FOOT RIVERFRONT AREA |
| ——— - - ——— | PROPERTY LINE |
| ▨ | COIR LOG |

0 50 100
SCALE IN FEET

| | | | | |
|---|---|---|---|---|
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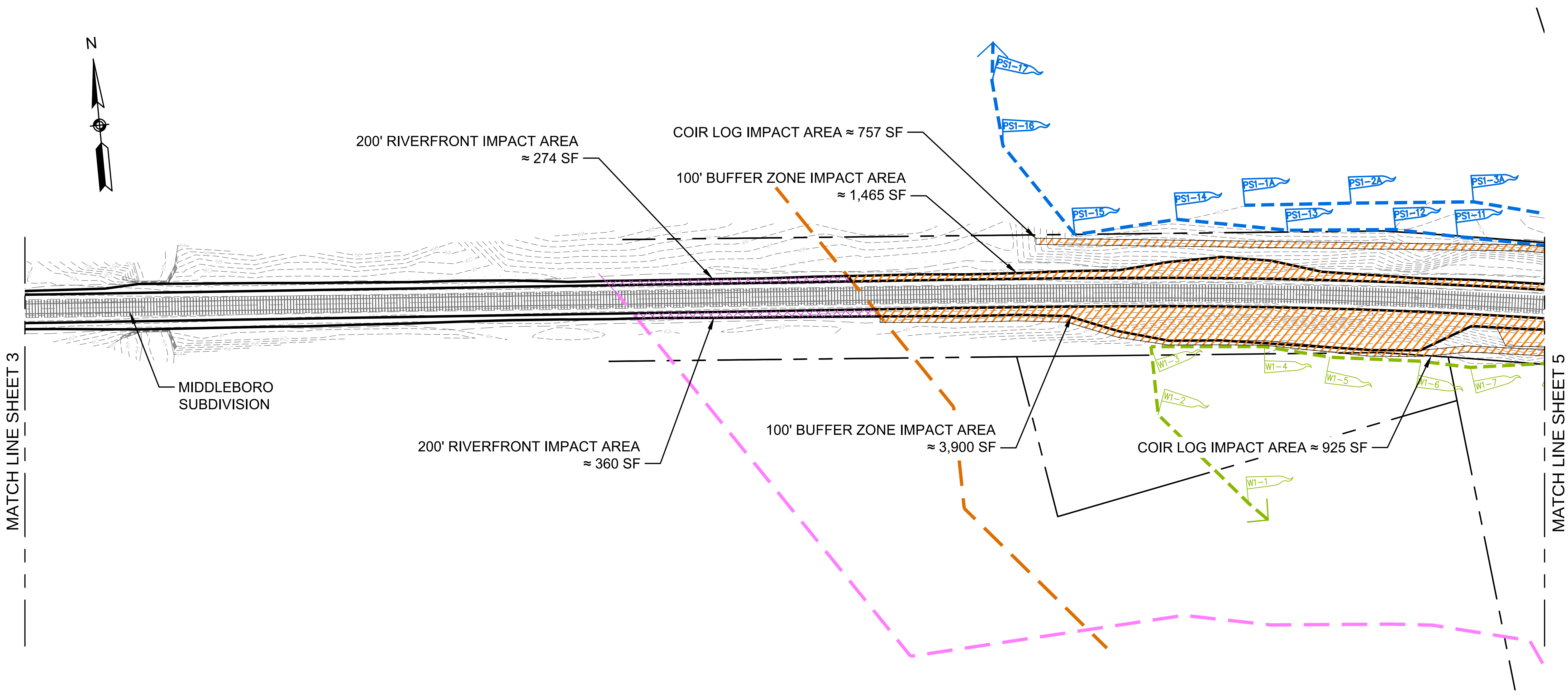
N
200' RIVERFRONT IMPACT AREA ≈ 274 SF
COIR LOG IMPACT AREA ≈ 757 SF
100' BUFFER ZONE IMPACT AREA ≈ 1,465 SF
PS1-17
PS1-16
PS1-15
PS1-14
PS1-1A
PS1-2A
PS1-3A
PS1-13
PS1-12
PS1-11
MATCH LINE SHEET 3
MIDDLEBORO SUBDIVISION
200' RIVERFRONT IMPACT AREA ≈ 360 SF
100' BUFFER ZONE IMPACT AREA ≈ 3,900 SF
COIR LOG IMPACT AREA ≈ 925 SF
W1-3
W1-4
W1-5
W1-6
W1-7
W1-2
W1-1
MATCH LINE SHEET 5

LEGEND

W1-1 BORDERING VEGETATIVE WETLAND (BVW)

100-FOOT BUFFER ZONE TO BVW

PS1-1 PERENNIAL STREAM (PS)

200-FOOT RIVERFRONT AREA

PROPERTY LINE

▨ COIR LOG

0 50 100
SCALE IN FEET

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March 23, 2021

MIDDLEBOROUGH SUBDIVISION
TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 4 OF 8

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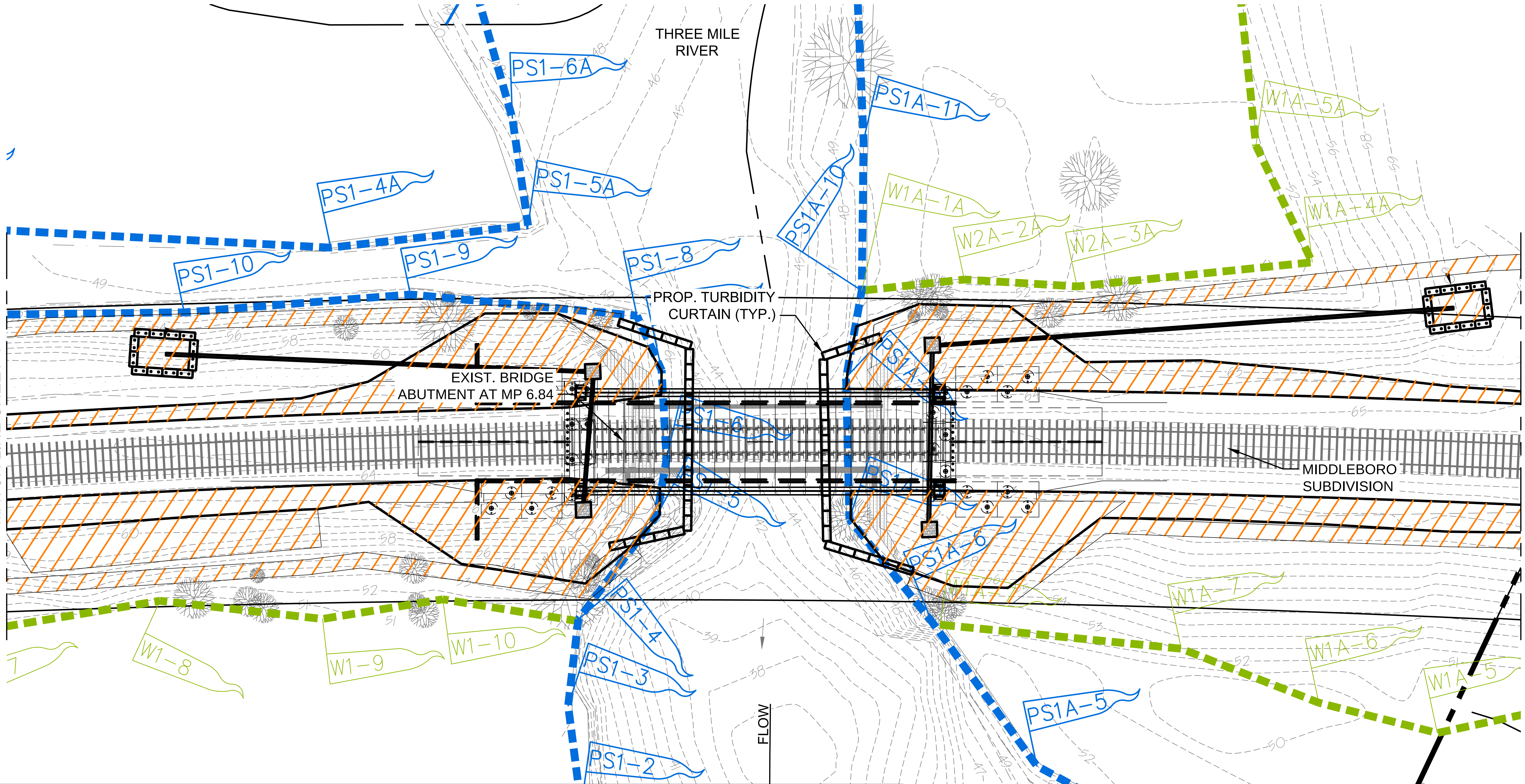

LEGEND

W1–1 BORDERING VEGETATIVE WETLAND (BVW)

100-FOOT BUFFER ZONE TO BVW

PS1–1 PERENNIAL STREAM (PS)

200-FOOT RIVERFRONT AREA

PROPERTY LINE

▨ COIR LOG

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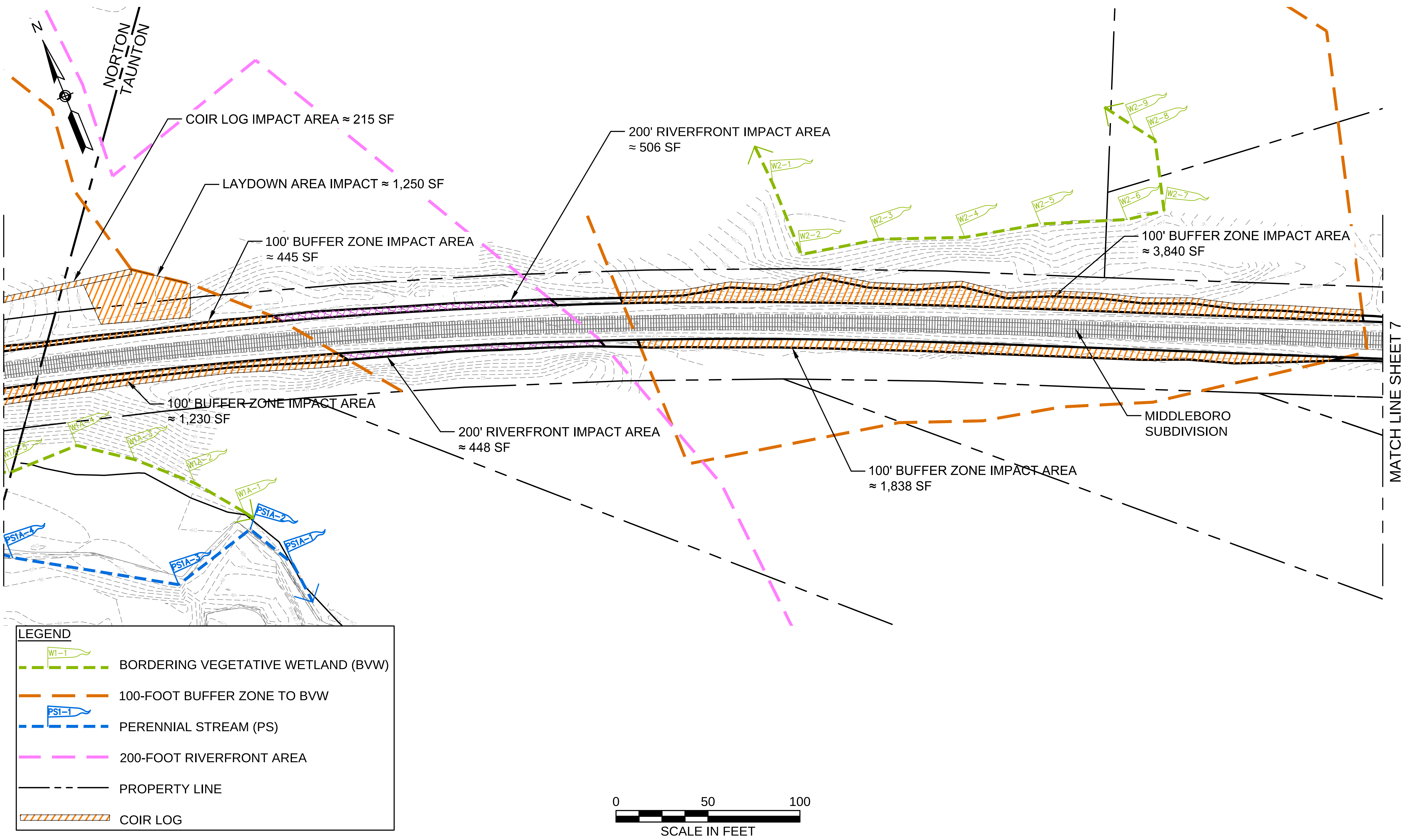
March 23, 2021

MIDDLEBOROUGH SUBDIVISION
NORTON, MA

BRIDGE AT MP 6.84
SHEET 5 OF 8


N
NORTON
TAUNTON
COIR LOG IMPACT AREA ≈ 215 SF
LAYDOWN AREA IMPACT ≈ 1,250 SF
100' BUFFER ZONE IMPACT AREA ≈ 445 SF
200' RIVERFRONT IMPACT AREA ≈ 506 SF
100' BUFFER ZONE IMPACT AREA ≈ 3,840 SF
100' BUFFER ZONE IMPACT AREA ≈ 1,230 SF
200' RIVERFRONT IMPACT AREA ≈ 448 SF
100' BUFFER ZONE IMPACT AREA ≈ 1,838 SF
MIDDLEBORO SUBDIVISION
MATCH LINE SHEET 5
MATCH LINE SHEET 7
W2-1
W2-2
W2-3
W2-4
W2-5
W2-6
W2-7
W2-8
W2-9
W1A-1
W1A-2
W1A-3
W1A-4
W1A-5
PS1A-1
PS1A-2
PS1A-3
PS1A-4
LEGEND
W1-1
BORDERING VEGETATIVE WETLAND (BVW)
100-FOOT BUFFER ZONE TO BVW
PS1-1
PERENNIAL STREAM (PS)
200-FOOT RIVERFRONT AREA
PROPERTY LINE
COIR LOG
0
50
100
SCALE IN FEET

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March 23, 2021

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TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 6 OF 8

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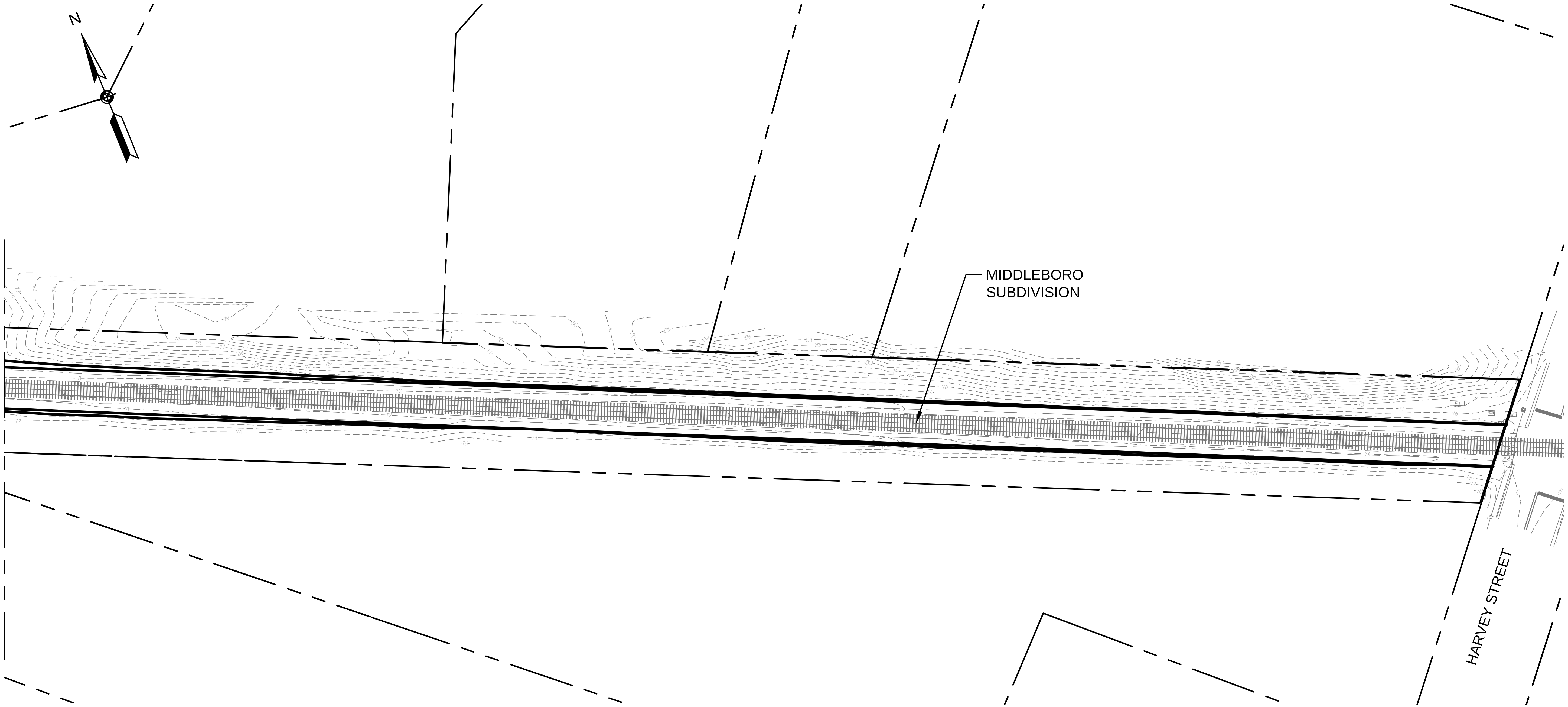

LEGEND

W1-1 BORDERING VEGETATIVE WETLAND (BVW)

100-FOOT BUFFER ZONE TO BVW

PS1-1 PERENNIAL STREAM (PS)

200-FOOT RIVERFRONT AREA

PROPERTY LINE

▨ COIR LOG

0 50 100
SCALE IN FEET

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March 23, 2021

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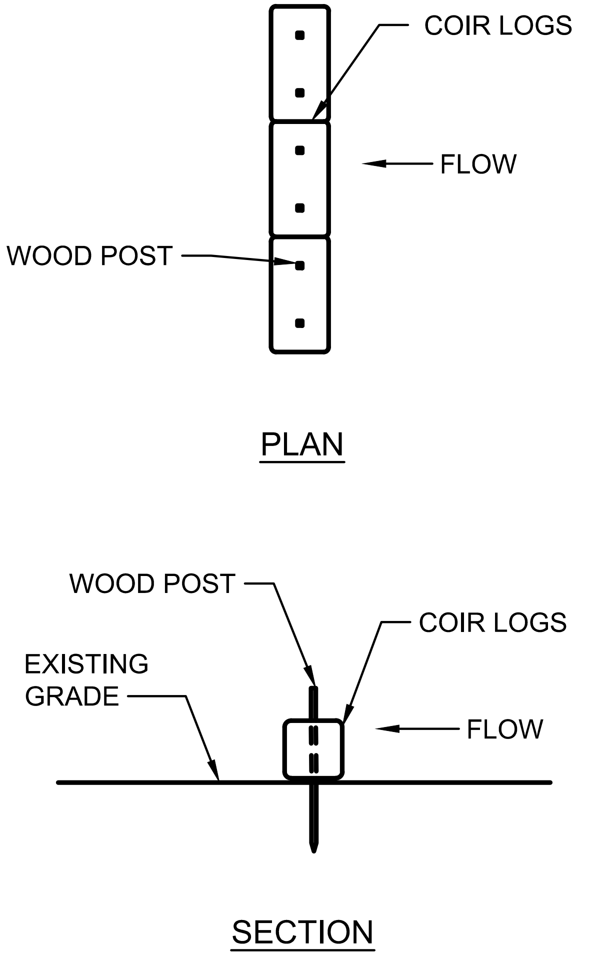
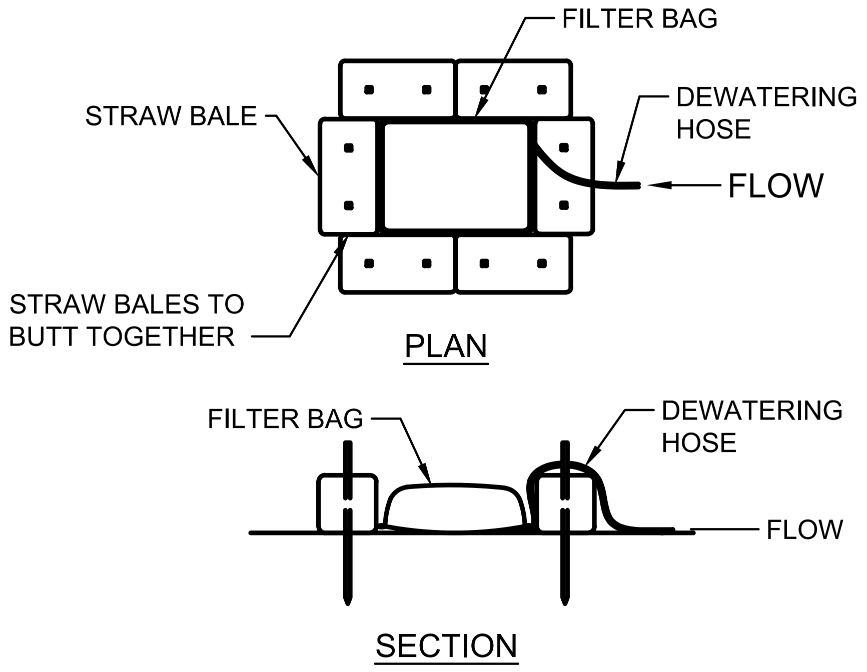
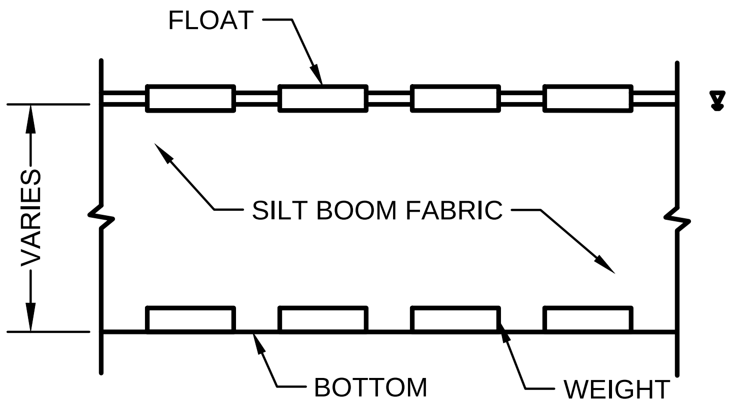
BRIDGE AT MP 6.84
SHEET 7 OF 8



COIR LOGS
EROSION CONTROL BARRIER



DEWATERING CONTAINMENT AREA
DETAIL



TURBIDITY CURTAIN
NOT TO SCALE

## EROSION CONTROL NOTES:

1. PRIOR TO BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT FOR ACCEPTANCE A GENERAL WORK SCHEDULE, CONSTRUCTION SEQUENCE AND PLAN WHICH INDICATES PLANNED IMPLEMENTATION OF TEMPORARY AND PERMANENT EROSION CONTROL MEASURES. THIS PLAN SHALL INCLUDE PROPOSED METHODS OF SOILS MANAGEMENT AND DISPOSAL OF WASTE MATERIALS.
2. THE TOE OF ANY SLOPE IS TO REMAIN AT LEAST ONE FOOT INSIDE OF ALL EROSION CONTROLS. UNDER NO CIRCUMSTANCE SHALL THE CONTRACTOR COVER ANY PORTION OF THE EROSION CONTROLS WITH MATERIAL. ANY MATERIAL THAT IS PLACED ON ANY EROSION CONTROLS BY THE CONTRACTOR, OR ANY AGENT OF THE CONTRACTOR, SHALL BE IMMEDIATELY REMOVED BY THE CONTRACTOR, AND ANY NECESSARY REPAIRS TO THE EROSION CONTROLS ACCOMPLISHED, AT NO COST TO THE OWNER.
3. ADDITIONAL EROSION CONTROLS SHALL BE INSTALLED AS CONDITIONS WARRANT, OR AS DIRECTED BY THE ENGINEER.
4. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EROSION CONTROL MAINTENANCE AND SHALL INSPECT AND/OR REPLACE ALL CONTROLS AS NEEDED. MAINTENANCE WILL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS AND PERMIT CONDITIONS. THE CONTRACTOR IS RESPONSIBLE FOR CARRYING OUT NECESSARY MAINTENANCE DURING ALL PHASES OF PROJECT CONSTRUCTION.
5. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING RUNOFF FLOW DURING STORMS AND PERIODS OF RAINFALL, THROUGHOUT THE WORK AREA.
6. SEDIMENTATION CONTROL DEVICES SHALL BE INSPECTED CLOSELY AND MAINTAINED PROMPTLY AS DESCRIBED IN THE SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER.
7. DISTURBED SLOPES ALONG THE ROW EMBANKMENT WITHIN THE WORK ZONE WILL BE STABILIZED WITH LOAM AND SEED OR BALLAST.

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March 23, 2021

MIDDLEBOROUGH SUBDIVISION
NORTON AND TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 8 OF 8

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| Resource Area | Ballast | Coir Logs Only | | | Permanent Impacts | Temporary Impacts |
|---|---|---|---|---|---|---|
| 100-foot Buffer Zone | 1,465 | 757 | | | 1,465 | 757 |
| | 3,900 | 925 | | | 3,900 | 925 |
| | | | **Total** | **7,047** | 5,365 | 1,682 |
| 100 to 200-foot Riverfront Area | 274 | | | | | |
| | 360 | | Total (100-200) | 634 | | |
| | | | Total (0-100) | 7,047 | | |
| | | | **Total (0-200)** | **7,681** | | |

*All calculations provied in square feet.

# Attachment B – USACE Data Forms

# WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: MassDOT Rail Bridge Replacement Project at MP 6.84 City/County: Norton/ Bristol County Sampling Date: 01/23/2019
Applicant/Owner: MassDOT Rail State: MA Sampling Point: DP1
Investigator(s): Kyle Purdy, Shilpa Sen Section, Township, Range: Town of Norton
Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR R Lat: 41°56'18.8"N Long: 71°09'21.0"W Datum: UTM 19
Soil Map Unit Name: Freetown muck, 0 to 1 percent slopes, Symbol 52A NWI classification: PFO1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are “Normal Circumstances” present? Yes X No ___
Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No ___ | **Is the Sampled Area** | |
| Hydric Soil Present? | Yes X No ___ | **within a Wetland?** | **Yes** X **No** ___ |
| Wetland Hydrology Present? | Yes X No ___ | If yes, optional Wetland Site ID: | Wetland 1/1A |

Remarks: (Explain alternative procedures here or in a separate report.)
Data point taken approximately 10 feet south of delineation flag W1-8.
Wetland 1/1A observed to drain directly into Perennial Stream 1 (Threemile River).
Wetland boundaries observed to continue both north and south beyond the Project's survey area.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

X Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
X Sediment Deposits (B2)
___ Drift Deposits (B3)
X Algal Mat or Crust (B4)
___ Iron Deposits (B5)
X Inundation Visible on Aerial Imagery (B7)
X Sparsely Vegetated Concave Surface (B8)
X Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Marl Deposits (B15)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
X Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

X Surface Soil Cracks (B6)
X Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
X Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X Microtopographic Relief (D4)
X FAC-Neutral Test (D5)

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes X No ___ | Depth (inches): | 2 |
| Water Table Present? | Yes X No ___ | Depth (inches): | - |
| Saturation Present?<br>(includes capillary fringe) | Yes X No ___ | Depth (inches): | - |

**Wetland Hydrology Present?** **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Saturated to surface

**VEGETATION** – Use scientific names of plants.

Sampling Point: DP1

| Tree Stratum (Plot size: 30 ) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Quercus bicolor* | 45 | Yes | FACW |
| 2. *Acer saccharinum* | 30 | Yes | FACW |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 75 | =Total Cover | |

| Sapling/Shrub Stratum (Plot size: 15 ) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Cornus alba* | 55 | Yes | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 55 | =Total Cover | |

| Herb Stratum (Plot size: 5 ) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Carex stricta* | 65 | Yes | FACW |
| 2. *Equisetum arvense* | 20 | No | FAC |
| 3. *Onoclea sensibilis* | 20 | No | FACW |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 105 | =Total Cover | |

| Woody Vine Stratum (Plot size: ) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | | =Total Cover | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | | x 1 = | |
| FACW species | | x 2 = | |
| FAC species | | x 3 = | |
| FACU species | | x 4 = | |
| UPL species | | x 5 = | |
| Column Totals: | | (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

**SOIL**

Sampling Point: DP1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-7 | 10YR 2/1 | 100 | | | | | | organic muck |
| 7-24 | 10YR 4/1 | 70 | 10YR 4/3 | 30 | D | M | | silty clay loam |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
X Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

**Indicators for Problematic Hydric Soils[3]:**

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type:

Depth (inches):

**Hydric Soil Present?** **Yes** X **No** ___

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

## WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: MassDOT Rail Bridge Replacement Project at MP 6.84 City/County: Taunton/Bristol County Sampling Date: 01/23/2019
Applicant/Owner: MassDOT Rail State: MA Sampling Point: DP2
Investigator(s): Kyle Purdy, Shilpa Sen Section, Township, Range: City of Taunton
Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 8-15
Subregion (LRR or MLRA): LRR R Lat: 41°56'17.5"N Long: 71°09'12.9"W Datum: UTM 19
Soil Map Unit Name: Windsor loamy sand, 8 to 15 percent slopes, Symbol 255C NWI classification: PFO1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes X No ___ | **Is the Sampled Area** |
| Hydric Soil Present? | Yes X No ___ | **within a Wetland? Yes X No ___** |
| Wetland Hydrology Present? | Yes X No ___ | If yes, optional Wetland Site ID: Wetland 2 |

Remarks: (Explain alternative procedures here or in a separate report.)
Data point taken approximately 10 feet north of delineation flag W2-5.
Wetland 2 observed to continue north outside of the Project Survey Area.
It is hypothesized that Wetland 2 ultimately drains northward directly into Perennial Stream 1 (Threemile River).

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- X Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- X Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes X No ___ | Depth (inches): 1 | |
| Water Table Present? | Yes X No ___ | Depth (inches): - | |
| Saturation Present? (includes capillary fringe) | Yes X No ___ | Depth (inches): - | **Wetland Hydrology Present? Yes X No ___** |

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Saturated to surface

**VEGETATION** – Use scientific names of plants.

Sampling Point: DP2

| Tree Stratum (Plot size: 30) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Acer saccharinum* | 55 | Yes | FACW |
| 2. *Acer rubrum* | 25 | Yes | FAC |
| 3. *Quercus bicolor* | 15 | No | FACW |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 95 | =Total Cover | |

| Sapling/Shrub Stratum (Plot size: 15) | | | |
|---|---|---|---|
| 1. *Cornus amomum* | 25 | Yes | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 25 | =Total Cover | |

| Herb Stratum (Plot size: 5) | | | |
|---|---|---|---|
| 1. *Onoclea sensibilis* | 25 | Yes | FACW |
| 2. *Solidago gigantea* | 5 | No | FACW |
| 3. *Carex lurida* | 5 | No | OBL |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 35 | =Total Cover | |

| Woody Vine Stratum (Plot size: ) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | | =Total Cover | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | | x 1 = | |
| FACW species | | x 2 = | |
| FAC species | | x 3 = | |
| FACU species | | x 4 = | |
| UPL species | | x 5 = | |
| Column Totals: | | (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

## SOIL

Sampling Point: DP2

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-5 | 10YR 2/2 | 100 | | | | | | organic muck |
| 5-24 | 10YR 4/2 | 80 | 10YR 4/4 | 20 | D | M | | silty clay loam |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- X Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ______

Depth (inches): ______

**Hydric Soil Present?** **Yes** X **No** ___

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

# WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: MassDOT Rail Bridge Repair/Replacement Project at MP 6.84 City/County: Norton/ Bristol County Sampling Date: 01/23/2019
Applicant/Owner: MassDOT Rail State: MA Sampling Point: UPDP1
Investigator(s): Kyle Purdy, Shilpa Sen Section, Township, Range: Town of Norton
Landform (hillside, terrace, etc.): hillside Local relief (concave, convex, none): none Slope (%): 0-1
Subregion (LRR or MLRA): LRR R Lat: 41°56'18.8"N Long: 71°09'21.0"W Datum: UTM 19
Soil Map Unit Name: Freetown muck, 0 to 1 percent slopes, Symbol 52A NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ___ No X | **Is the Sampled Area** | |
| Hydric Soil Present? | Yes ___ No X | **within a Wetland?** | **Yes** ___ **No** X |
| Wetland Hydrology Present? | Yes ___ No X | If yes, optional Wetland Site ID: | N/A |

Remarks: (Explain alternative procedures here or in a separate report.)
Data point taken approximately 10 feet west of W1-3.
Not a wetland.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes ___ | No X | Depth (inches): ___ |
| Water Table Present? | Yes ___ | No X | Depth (inches): ___ |
| Saturation Present? (includes capillary fringe) | Yes ___ | No X | Depth (inches): ___ |

**Wetland Hydrology Present?** **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Saturated to surface

**VEGETATION** – Use scientific names of plants.

Sampling Point: UPDP1

| Tree Stratum (Plot size: 30 ) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Pinus strobus* | 45 | Yes | FACU |
| 2. *Tsuga canadensis* | 40 | Yes | FACU |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 85 | =Total Cover | |

| Sapling/Shrub Stratum (Plot size: 15 ) | | | |
|---|---|---|---|
| 1. *Quercus rubra* | 30 | Yes | FACU |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 30 | =Total Cover | |

| Herb Stratum (Plot size: 5 ) | | | |
|---|---|---|---|
| 1. *Osmundastrum cinnamomeum* | 20 | Yes | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 20 | =Total Cover | |

| Woody Vine Stratum (Plot size: ) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | | =Total Cover | |

**Dominance Test worksheet:**

| | | |
|---|---|---|
| Number of Dominant Species That Are OBL, FACW, or FAC: | 1 | (A) |
| Total Number of Dominant Species Across All Strata: | 4 | (B) |
| Percent of Dominant Species That Are OBL, FACW, or FAC: | 25.0% | (A/B) |

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | | |
|---|---|---|---|---|
| OBL species | 0 | x 1 = | 0 | |
| FACW species | 20 | x 2 = | 40 | |
| FAC species | 0 | x 3 = | 0 | |
| FACU species | 115 | x 4 = | 460 | |
| UPL species | 0 | x 5 = | 0 | |
| Column Totals: | 135 | (A) | 500 | (B) |

Prevalence Index = B/A = 3.70

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

## SOIL

Sampling Point: UPDP1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-3 | 10YR 3/2 | 100 | | | | | | Sandy Clay Loam |
| 3-9 | 10YR 6/6 | 100 | | | | | | Sandy Loam |
| 9-22 | 10YR 6/8 | 100 | | | | | | Sandy Loam |

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

**Indicators for Problematic Hydric Soils[3]:**

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ______

Depth (inches): ______

**Hydric Soil Present?** **Yes** ___ **No** X

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

# WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: MassDOT Rail Bridge Repair/Replacement Project at MP 6.84 City/County: Taunton/Bristol County Sampling Date: 01/23/2019

Applicant/Owner: MassDOT Rail State: MA Sampling Point: UPDP2

Investigator(s): Kyle Purdy, Shilpa Sen Section, Township, Range: City of Taunton

Landform (hillside, terrace, etc.): hillside Local relief (concave, convex, none): none Slope (%): 0-1

Subregion (LRR or MLRA): LRR R Lat: 41°56'17.5"N Long: 71°09'12.9"W Datum: UTM 19

Soil Map Unit Name: Windsor loamy sand, 8 to 15 percent slopes, Symbol 255C NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ___ | No X | **Is the Sampled Area** |
| Hydric Soil Present? | Yes ___ | No X | **within a Wetland?** **Yes** ___ **No** X |
| Wetland Hydrology Present? | Yes ___ | No X | If yes, optional Wetland Site ID: N/A |

Remarks: (Explain alternative procedures here or in a separate report.)
Data point taken approximately 5 feet west of W2-2.
Not a wetland.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes ___ | No X | Depth (inches): ___ |
| Water Table Present? | Yes ___ | No X | Depth (inches): ___ |
| Saturation Present?<br>(includes capillary fringe) | Yes ___ | No X | Depth (inches): ___ |

**Wetland Hydrology Present?** **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Saturated to surface

## **VEGETATION** – Use scientific names of plants.

Sampling Point: UPDP2

| Tree Stratum (Plot size: 30 ) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Quercus rubra* | 55 | Yes | FACU |
| 2. *Pinus strobus* | 25 | Yes | FACU |
| 3. *Tsuga canadensis* | 20 | Yes | FACU |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 100 | =Total Cover | |
| Sapling/Shrub Stratum (Plot size: 15 ) | | | |
| 1. *Lonicera tatarica* | 15 | Yes | FACU |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 15 | =Total Cover | |
| Herb Stratum (Plot size: 5 ) | | | |
| 1. *Polystichum acrostichoides* | 20 | Yes | FACU |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 20 | =Total Cover | |
| Woody Vine Stratum (Plot size: ) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | | =Total Cover | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 0 | x 2 = | 0 |
| FAC species | 0 | x 3 = | 0 |
| FACU species | 135 | x 4 = | 540 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 135 (A) | | 540 (B) |

Prevalence Index = B/A = 4.00

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

# SOIL

Sampling Point: UPDP2

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-11 | 10YR 3/2 | 100 | | | | | | Sandy Loam |
| 11-24 | 10YR 3/4 | 100 | | | | | | Sandy Loam |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

**Indicators for Problematic Hydric Soils[3]:**

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: ___
Depth (inches): ___

**Hydric Soil Present?** **Yes** ___ **No** X

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

# Attachment C – Photographic Log

## PHOTOGRAPHIC LOG

**Site Location:** MassDOT Rail, Norton and Taunton, Massachusetts

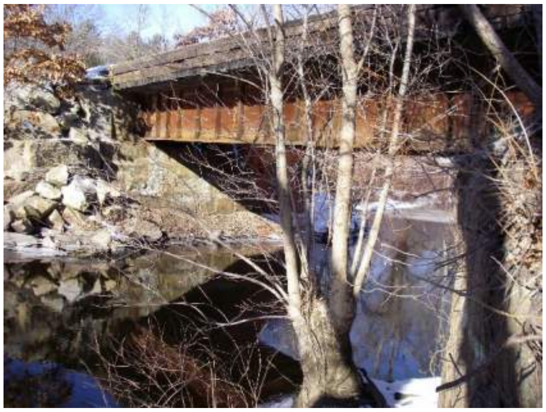
**Project No.** E2X83500

**Photo No.** 1

**Date:** 1/22/2020

**Direction Photo Taken:**
Northeast (left photograph) and East (right photograph).

**Description:**
View of bridge abutments. Photographs taken from edge of Perennial Stream 1.



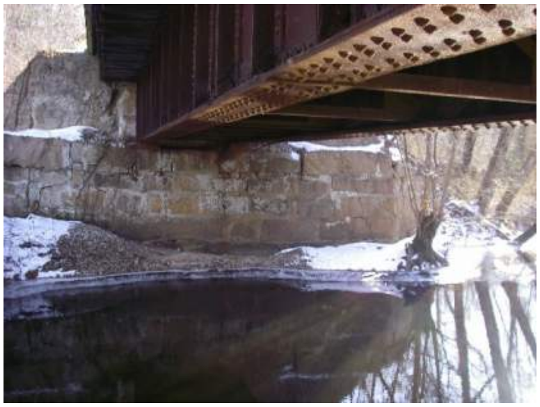
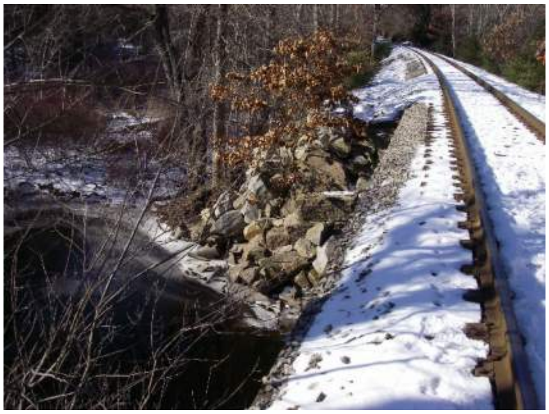


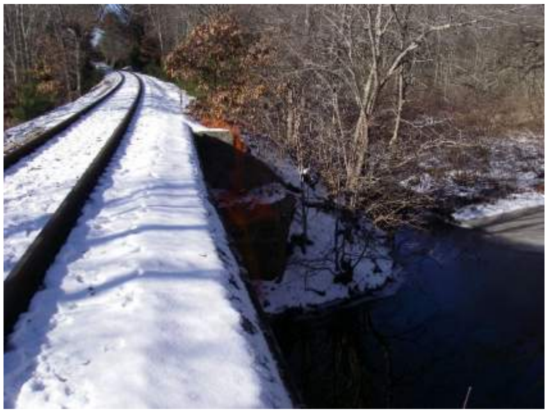
**Photo No.** 2

**Date:** 1/22/2020

**Direction Photo Taken:**
West.

**Description:**
View of western bridge abutment; left photograph taken of southern side of railroad and right photograph taken of northern side of railroad. Photographs taken from atop of the railroad tracks.





## PHOTOGRAPHIC LOG

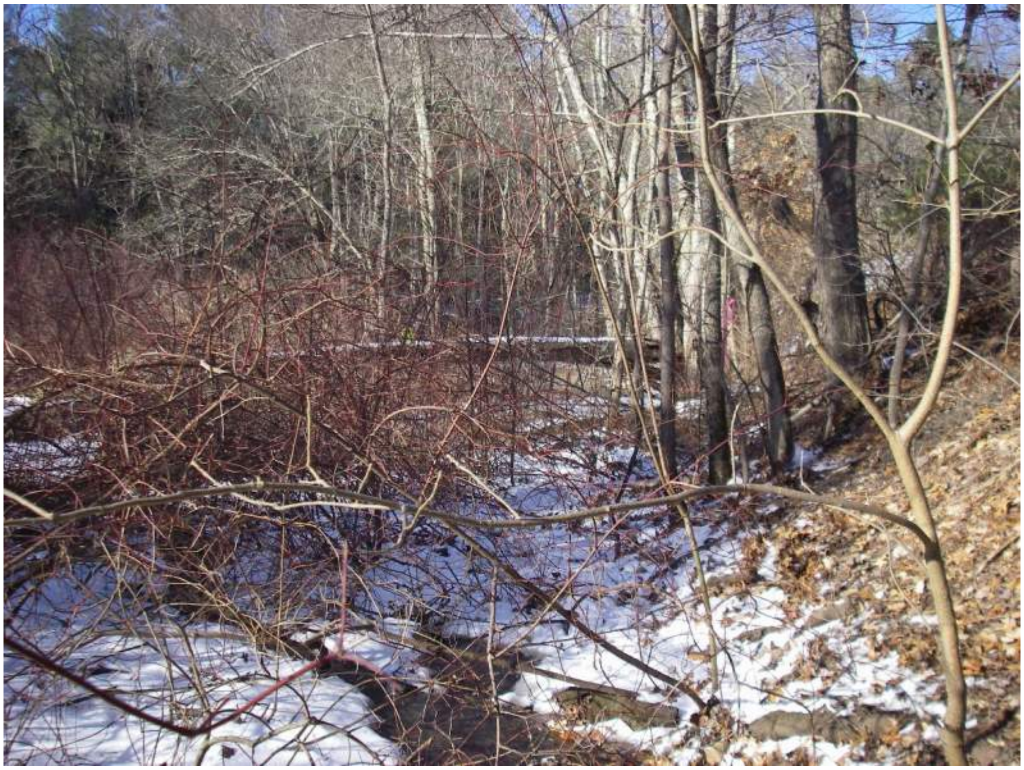
**Site Location:** MassDOT Rail, Norton and Taunton, Massachusetts

**Project No.** E2X83500

| **Photo No.** | **Date:** |
|---|---|
| 3 | 1/22/2020 |

**Direction Photo Taken:**
West.

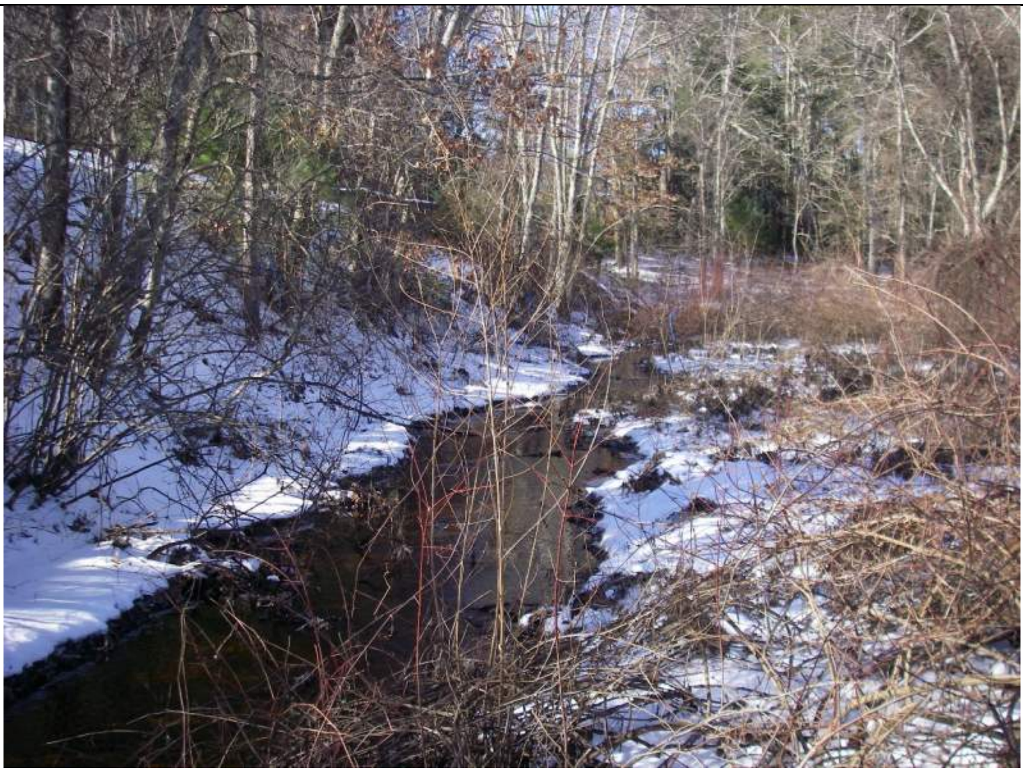
**Description:**
View of Wetland 1 located along the toe-of-slope of the railroad embankment. Photograph taken from delineation flag W1-12 + PS1-4.



| **Photo No.** | **Date:** |
|---|---|
| 4 | 1/22/2020 |

**Direction Photo Taken:**
West.

**Description:**
View of extension of Perennial Stream 1 continuing westward along the toe-of-slope of the railroad embankment. Wetland 1A located in the right hand portion of the photograph.



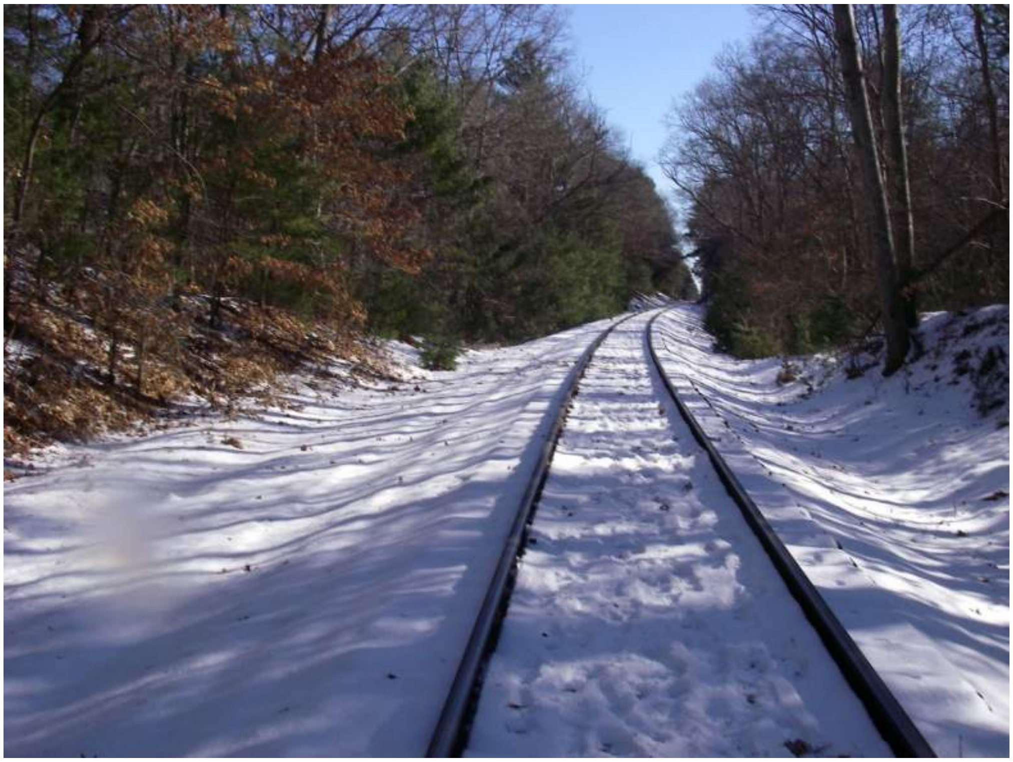
# PHOTOGRAPHIC LOG

| | |
|---|---|
| **Site Location:** MassDOT Rail, Norton and Taunton, Massachusetts | **Project No.** E2X83500 |

| | |
|---|---|
| **Photo No.**<br>5 | **Date:**<br>1/22/2020 |

**Direction Photo Taken:**
East.

**Description:**
View of railroad right-of-way looking away from bridge. Photograph taken approximately 300 feet east of the bridge.



# Attachment D – Stormwater Checklist

**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands Program

# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

---

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

## Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

JOHN J.
WILSON
CIVIL
No. 54236

March 24, 2021
Signature and Date

## Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☐ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

  ☐ Credit 1

  ☐ Credit 2

  ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): ____________________

**Standard 1: No New Untreated Discharges**

☐ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 2: Peak Rate Attenuation**

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

**Standard 3: Recharge**

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

  ☐ Static  ☐ Simple Dynamic  ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

  ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface

  ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

  ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
  ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

---

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 3: Recharge** (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

**Standard 4: Water Quality**

The Long-Term Pollution Prevention Plan typically includes the following:
- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

  ☐ is within the Zone II or Interim Wellhead Protection Area

  ☐ is near or to other critical areas

  ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

  ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

## Checklist (continued)

**Standard 4: Water Quality** (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

**Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)**

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

**Standard 6: Critical Areas**

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

## Checklist (continued)

**Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable**

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

**Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control**

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

# Checklist for Stormwater Report

## **Checklist** (continued)

**Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control** (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

**Standard 9: Operation and Maintenance Plan**

☐ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

  ☐ Name of the stormwater management system owners;

  ☐ Party responsible for operation and maintenance;

  ☐ Schedule for implementation of routine and non-routine maintenance tasks;

  ☐ Plan showing the location of all stormwater BMPs maintenance access areas;

  ☐ Description and delineation of public safety features;

  ☐ Estimated operation and maintenance budget; and

  ☐ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

  ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;

  ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

**Standard 10: Prohibition of Illicit Discharges**

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

# Attachment E – Hydraulic Analysis

# Hydrologic/Hydraulic Report

## Attleboro Secondary Line over Three Mile River
## Bridge N-23-029
## Milepost 6.84
## Norton, Massachusetts

**November 20, 2020**

PREPARED FOR:

MassDOT – Rail Division
2 Park Plaza
Boston, MA 02110

PREPARED BY:

Jacobs Engineering Group Inc.
120 St. James Avenue, 5th Floor
Boston, MA  02116
(617) 242-9222

# Table of Contents

1.0 Executive Summary ........ 1
2.0 Project Description ........ 2
  2.1 Existing Structure ........ 2
  2.2 Proposed Action ........ 2
3.0 Data Collection ........ 4
  3.1 Data Sources ........ 4
  3.2 Existing Ground Data ........ 4
4.0 Engineering Methods ........ 5
  4.1 Hydrologic Analysis ........ 5
  4.2 Hydraulic Analysis ........ 5
  4.3 Scour / Stability Analysis ........ 6
  4.4 Scour Countermeasure Design ........ 7
5.0 Conclusions and Recommendations ........ 8
  5.1 Conclusions ........ 8
  5.2 Recommendations ........ 8

**Appendices**

A Existing Site Photos
B USGS StreamStats Data Collection Report for Station Number 01109060
C USGS Ungaged Site Regression Calculations
D FEMA FIRMETTE for Project Site
E Existing HEC-RAS Model and Results
F Proposed HEC-RAS Model and Results
G Scour / Stability Analysis
H Riprap Protection Calculations

**List of Figures**

Figure 2-1: USGS Map, Norton Quadrangle ........ 3

**List of Tables**

Table 4-1: Summary of Design Discharge Flow Rates ........ 5
Table 4-2: Summary of Hydraulic Performance ........ 6
Table 4-3: Summary of Calculated Scour for Bridge ........ 6
Table 4-4: Summary of Scour Countermeasure Design at Bridge Abutments ........ 7
Table 5-1: Hydraulic Design Data ........ 8

## 1.0 Executive Summary

This project involves the replacement of an existing 46 foot-9 inch single span structure on the Attleboro Secondary Line over Three Mile River in Norton, Massachusetts. The existing bridge is located between Route 140 (Taunton Avenue) and Harvey Street, just west of the Norton / Taunton Town Boundary.

The existing bridge is a ballasted deck plate girder structure originally constructed in 1883 and rebuilt in 1921. The abutments are constructed of granite block masonry with concrete backwalls. The deck, superstructure, and substructure are in poor condition and in need of replacement.

At the project site, the area bounding the river is located within Zone A, as delineated by the National Flood Insurance Program (NFIP) maps published by FEMA. Zone A areas are Special Flood Hazard Areas subject to inundation by the 1% (100-year flood) where base flood elevations have not been determined. Surrounding upland areas are designated Zone X for areas of minimal flood hazard. There is no Flood Insurance Study for Three Mile River.

A hydrologic analysis of the upstream watershed was completed to determine flow rates at the bridge using USGS Streamfow Statistics from a nearby gage station. The contributing watershed area is measured to be approximately 72.7 square miles. The flood event to be used for design purposes is the 100-year flood. The estimated peak discharge for the 100-year flood is 2,964 cubic feet per second (cfs).

The proposed bridge replacement will be a single span ballasted through girder superstructure. New abutments will be constructed behind the existing abutments to increase the span to 71 ft – 0 in, providing 65 ft – 0 in clear between the new abutments. The existing abutments will be cut such that the lower portion remains in place. The proposed bridge structure does not increase the base flood elevation for the design storm nor for any of the other storm events included in the analysis.

Hydraulic models of the existing and proposed bridges were developed using HEC-RAS, as developed US Army Corps of Engineers. Topography was obtained from a ground survey as well as contour data from MassGIS. The 10-, 50-, 100-, 200-, and 500-year return frequencies were included in the models.

A scour safety assessment was performed using the NCHRP 24-20 Abutment Scour Approach. For a hydraulic design 100-year return frequency, the scour design flood return frequency and the scour check flood return frequency shall be the 200-year and 500-year, respectively. The scour safety analysis for the proposed structure estimates a total scour depth of 2.8 feet in the 200-year flood and 3.0 feet in the 500-year flood.

Scour countermeasures shall include dumped riprap for the proposed slopes from the main channel/existing cut abutments to the proposed abutments. A 500-year return frequency was used for the scour countermeasure design calculations.

This report and the analyses included herein were prepared in accordance with Load and Resistance Factor Design (LRFD) Bridge Manual, January 2020 Revision, published by MassDOT.

# 2.0 Project Description

## 2.1 Existing Structure

Bridge N-23-029 is located in the Town of Norton, Massachusetts, just west of the Town boundary line with Taunton. The existing superstructure consists of two deck plate girders supporting a ballasted deck. The substructure consists of granite block masonry abutments and wingwalls with concrete backwalls. The bridge width is 14'-0". The bridge was originally constructed in 1883 and was rebuilt in 1921.

The deck, superstructure, and substructure are all in poor condition according to an inspection conducted in December 2011. Deck timbers and ties have minor to moderate rot. The superstructure exhibits rusting, pitting and section loss throughout. Wingwalls and backwalls exhibit extensive cracking, spalls, and missing blocks.

A USGS map showing the project location is included in Figure 2-1. Photographs taken in January 2020 of the project site are included in Appendix A.

### 2.1.1 Crossed Waterway

The waterway crossed by this bridge is Three Mile River. Upstream and downstream of the bridge, the river is characterized by wide, wooded and weedy floodplains. A winding channel conveys the smaller, permanent water flow. The river profile is nearly flat, which supports the slow observed water velocities.

The headwaters to Three Mile River originate from several small unnamed ponds and streams and flow in the southerly direction through the Town of Norton to the project location. Two named streams, Wading River and Meadow Brook, flow into Three Mile River upstream of the project site.

The history of any ice floes and/or floods at this bridge is unknown.

### 2.1.2 Highway Conveyed

The facility conveyed by the existing bridge structure is an active railroad for freight traffic. This railroad layout consists of a single track.

### 2.1.3 Land Uses in Vicinity of Bridge

Land use in the vicinity of the bridge is primarily undeveloped forest and wetlands.

The closest residential development is located approximately 1,000 feet to the east of the bridge. Brandy Lane is a cul-de-sac with 7 housing units on approximately 1 acre lots. Additional residences are sparsely located along Taunton Avenue and Harvey Street.

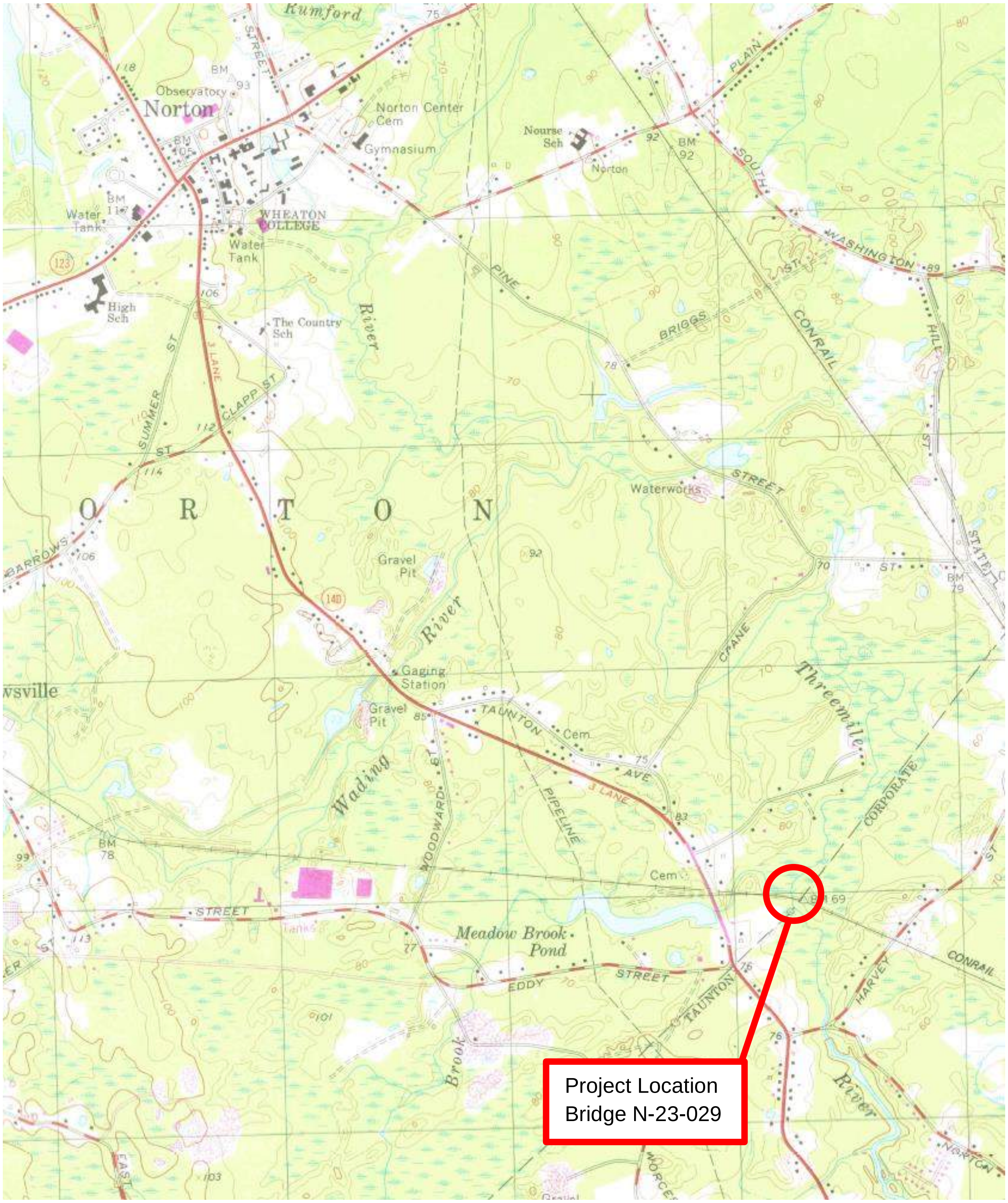
### 2.1.4 Special Site Considerations

The National Flood Insurance Program (NFIP) does not have a study for Three Mile River at this location. A FIRMETTE of the project site and the surrounding area is included in Appendix D.

## 2.2 Proposed Action

The proposed bridge replacement superstructure consists of single span ballasted through girders. The span will be increased to 71 feet–0 inches with 65 feet–0 inches clear between new abutments. Both new concrete abutments will be set approximately 11 feet behind the existing abutments. The existing abutments will be cut down to an elevation of approximately 50.0. Riprap slopes will extend up at a slope of 2:1 from the top of the cut abutments to the new abutments with a 2 foot wide shelf.

**Figure 2-1: USGS Map, Norton Quadrangle, 7.5 Minute series**



Project Location
Bridge N-23-029

## 3.0 Data Collection

### 3.1 Data Sources

References and data sources utilized for the hydraulic analysis and design of this project include:

- Topographic ground survey, performed in March 2020.
- MassGIS Contour Data, May 2020.
- Load and Resistance Factor Design (LRFD) Bridge Manual, January 2020 Revision, published by MassDOT.
- USGS Topographic Map, Norton, MA, 7.5 Minute Series.
- National Flood Insurance Program (NFIP), Flood Insurance Rate Maps (FIRM):
  Map Number 25005C0133G, Town of Norton, MA, 07/16/2015
  Map Number 25005C0134F, Town of Norton, MA, 07/07/2009
  Map Number 25005C0141F, Town of Norton, MA, 07/07/2009
  Map Number 25005C0142F, City of Taunton, MA, 07/07/2009
- StreamStats, USGS Station Number 01109060, Three Mile River at North Dighton, MA.
- Hydraulic Engineering Circular Number 18 (HEC-18), Evaluating Scour at Bridges, April 2012, published by Federal Highway Administration (FHWA).
- Hydraulic Engineering Circular Number 23 (HEC-23) Bridge Scour and Stream Instability Countermeasures, March 2001, published by Federal Highway Administration (FHWA).
- HEC-RAS River Analysis System, Hydraulic Reference Manual, version 5.0, February 2016, published by US Army Corps of Engineers Hydrologic Engineering Center.
- Massachusetts Bay Transportation Authority Bridge Inspection Report, December 2011, prepared by Vanasse Hangen Brustlin, Inc.
- Load Rating Report, 2018.

Uses of these references are discussed in further detail in the methodology portions of this report. All elevations referenced in the report are in feet, vertical datum NAVD 88.

There are no other known hydrologic / hydraulic studies available.

### 3.2 Existing Ground Data

Topograhpic survey was performed along the track bed and along the main river channel to the upstream and downstream of the existing bridge. Farland Corp. completed the topographic survey in March 2020.

For modeling floodplain areas along the main river channel, contour data was downloaded from MassGIS in May 2020.

# 4.0 Engineering Methods

## 4.1 Hydrologic Analysis

The watershed area for this project location is approximately 72.7 square miles. There is no Flood Insurance Study (FIS) for Three Mile River within the study area. For the purpose of estimating flows from various storm events, flow data was obtained from an active, downstream stream gage (USGS Station Number 01109060) located on Three Mile River in North Dighton. The watershed area at the stream gage site is approximately 84.6 square miles. The data report from this gage is included in Appendix B.

With the flow data from the gaged site, peak flows were estimated at the project location using a worksheet developed by the USGS that is specific to streams in Massachusetts. The worksheet confirms that the DA (Drainage Area) ratio of 0.86 is acceptable for use to estimate flow rates at the project location. Appendix C contains the regression worksheets for each storm event.

A summary of the estimated peak flood discharge flow rates at the project site is shown in Table 4-1 below:

**Table 4-1: Summary of Estimated Peak Flood Discharges**

| | **Return Frequency** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Three Mile River** | **50% Annual Chance (2-yr) (cfs)** | **10% Annual Chance (10-yr) (cfs)** | **4% Annual Chance (25-yr) (cfs)** | **2% Annual Chance (50-yr) (cfs)** | **1% Annual Chance (100-yr) (cfs)** | **0.5% Annual Chance (200-yr) (cfs)** | **0.2% Annual Chance (500-yr) (cfs)** |
| Bridge N-23-029 | 923 | 1729 | 2201 | 2575 | 2964 | 3377 | 3962 |

## 4.2 Hydraulic Analysis

The U.S. Army Corps of Engineers (USACOE), Hydrologic Engineering Center River Analysis System (HEC-RAS) program, Version 5.0.7, was utilized for the hydraulic analysis for the existing and proposed conditions.

The Manning's "n" values selected for the main channel and overbank areas were 0.070 and 0.100, respectively. These values were obtained from the HEC-RAS River Analysis System, Hydraulic Reference Manual, version 5.0. The contraction and expansion coefficients were held constant at 0.1 and 0.3 values, respectively at open stream cross sections and increased to 0.3 and 0.5, respectively at sections near the bridge location. Normal depth was used for the downstream boundary condition with an assumed profile grade of 0.1%. A subcritical flow regime was selected for the steady flow analysis.

### 4.2.1 Existing Conditions Model

An existing conditions model was created from the topographic survey in the immediate vicinity of the bridge and the main river channel. The model extends for approximately 500 feet along the river downstream of the bridge and for approximately 550 feet upstream of the bridge. Additional contour data was obtained from MassGIS to depict the floodplain topography. Results for the existing conditions hydraulic model are included in Appendix E.

### 4.2.2 Proposed Condition Model

The proposed conditions model was created by replacing the existing bridge with the proposed structure. The river sections remain the same throughout the model. Results for the proposed conditions hydraulic model at the river section on the upstream side of the bridge are included in Appendix F. Table 4-2, below, contains the computed water surface elevations and velocities for the 10-, 50-, 100-, 200-, and 500-year return frequencies at Station 5+35:

**Table 4-2: Summary of Hydraulic Performance**

| | | Existing Condition | | Proposed Conditions | | Change in Water Surface Elev. (ft) |
|---|---|---|---|---|---|---|
| **Return Frequency** | **Peak Flow Rate (cfs)** | **Water Surface Elevation (ft)** | **Velocity (ft/s)** | **Water Surface Elevation (ft)** | **Velocity (ft/s)** | |
| 10-Year | 1729 | 54.13 | 4.23 | 53.93 | 3.52 | -0.20 |
| 50-Year | 2575 | 55.38 | 5.54 | 55.05 | 4.56 | -0.33 |
| 100-Year | 2964 | 55.91 | 6.07 | 55.51 | 4.99 | -0.40 |
| 200-year | 3377 | 56.46 | 6.58 | 55.98 | 5.41 | -0.48 |
| 500-Year | 3962 | 57.23 | 7.24 | 56.60 | 5.96 | -0.63 |

## 4.3 Scour / Stability Analysis

A scour safety assessment was performed in accordance with Section 1.3.3.5 of the MassDOT Bridge Manual. The NCHRP 24-20 Abutment Scour Approach in HEC-18 was used to calculate the total abutment scour depth. Scour calculations are included in Appendix G.

The NCHRP 24-20 abutment scour method utilizes the ratio between the projected length of embankment divided by the width of the floodplain to determine the scour condition for the structure. The two scour conditions consist of clear-water scour and live-bed scour. The existing and proposed structures for this project experience live-bed scour, which does not use the $D_{50}$ particle size in the equation.

Scour was evaluated for the return frequencies in accordance with Table 1.3.4-2 of the MassDOT Bridge Manual. For a design flood frequency of 100 years, the Scour Design Flood Return Frequency is 200 years, and the Scour Check Flood Return Frequency is 500 years. Both the Scour Design and Scour Check Flood Return Frequencies were used to estimate total abutment scour. A summary of calculated abutment scour depths are found in Table 4-3, below:

**Table 4-3: Summary of Calculated Scour for Bridge**

| Alternative | Return Frequency (Year) | Design Abutment Scour Depth (Feet) |
|---|---|---|
| Existing Condition | 200 (Design Flood) | 5.1 |
| | 500 (Check Flood) | 5.6 |
| Proposed Condition | 200 (Design Flood) | 4.0 |
| | 500 (Check Flood) | 4.3 |

### 4.4 Scour Countermeasure Design

To protect against potential scour problems at the proposed bridge, riprap protection is a recommended countermeasure along the proposed abutments. The stream velocity and flow depth were obtained from the HEC-RAS model for the 500-year hydraulic design flood return frequency. This information was used to determine the size and thickness of riprap scour countermeasures as evaluated in HEC-23. The estimated $D_{50}$ stone size is 12.2 inches, with a minimum layer thickness of 18.3 inches. The riprap size and thickness calculations are included in Appendix H. Dumped Riprap (MassDOT Standard Specification M2.02.2) will meet the $D_{50}$ stone size for this project.

**Table 4-4: Summary of Scour Countermeasure Design at Bridge Abutments**

| Alternative | Riprap Size $D_{50}$ (Inches) | Riprap Thickness (Inches) |
|---|---|---|
| Existing Condition | 25.5 | 38.2 |
| Proposed Condition | 12.2 | 18.3 |

# 5.0 Conclusions and Recommendations

## 5.1 Conclusions

The hydraulic analysis indicates that the proposed bridge replacement conveys the 100-year design flood while providing approximately 4.5 feet of freeboard between the bottom of the proposed superstructure and the water surface. Additionally, the analysis shows that the proposed bridge slightly decreases the base flood elevation along the river in the vicinity of the bridge.

## 5.2 Recommendations

The new slopes between the remaining existing stream bed and new foundations should be stabilized with Dumped Riprap (MassDOT Standard Specification M2.02.2) over a layer of crushed stone (MassDOT Standard Specification M2.01.0) placed on geotextile fabric for separation (MassDOT Standard Specification M9.50.0).

The total scour design and scour check depths estimated for the proposed conditions shall be utilized for the foundation bearing capacity and structural stability verification calculations.

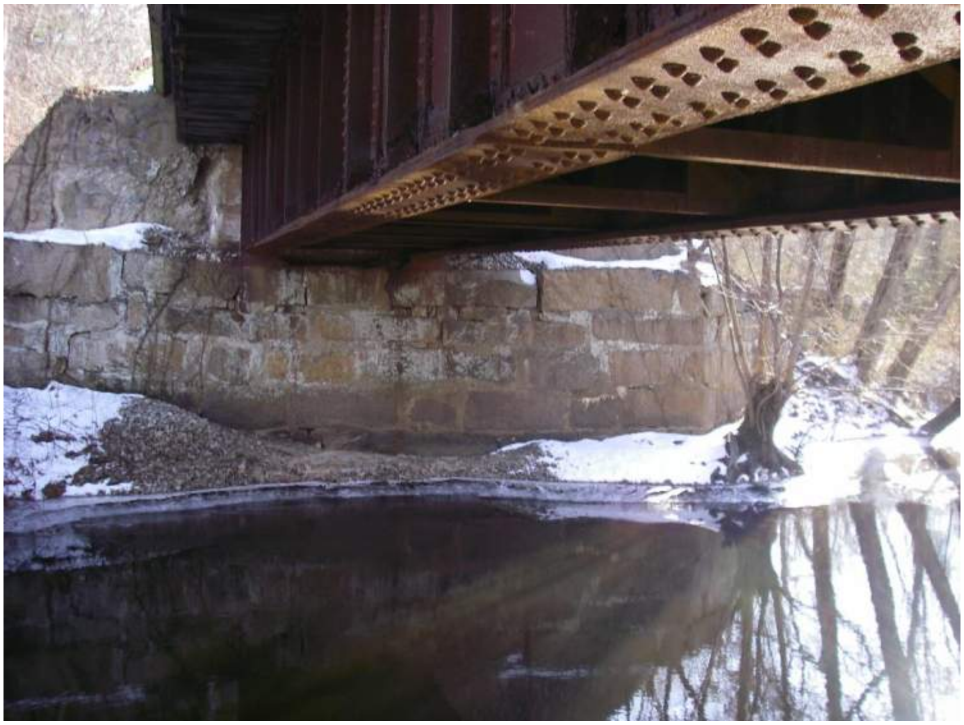
**Table 5-1: Hydraulic Design Data**

| **Hydraulic Design Data** | |
|---|---|
| Drainage Area: | 72.7 Square Miles |
| Design Flood Discharge: | 2,964 cubic feet per second |
| Design Flood Annual Chance (Return Frequency): | 1% (100-year) |
| Design Flood Velocity: | 4.99 feet per second |
| Design Flood Elevation: | 55.51 feet (NAVD 88) |
| | |
| **Base (100-Year) Flood Data** | |
| Base Flood Discharge: | 2,964 cubic feet per second |
| Base Flood Elevation: | 55.51 feet (NAVD 88) |
| | |
| **Design and Check Scour Data** | |
| Scour Design Flood Annual Chance (Return Frequency): | 0.5% (200-year) |
| Design Flood Abutment Scour Depth: | 4.0 feet |
| Scour Design Flood Annual Chance (Return Frequency): | 0.2% (500-year) |
| Design Flood Abutment Scour Depth: | 4.3 feet |
| | |
| **Flood of Record** | |
| Discharge: | Unknown |
| Frequency (if known): | Unknown |
| Maximum Elevation: | Unknown |
| Date: | Unknown |

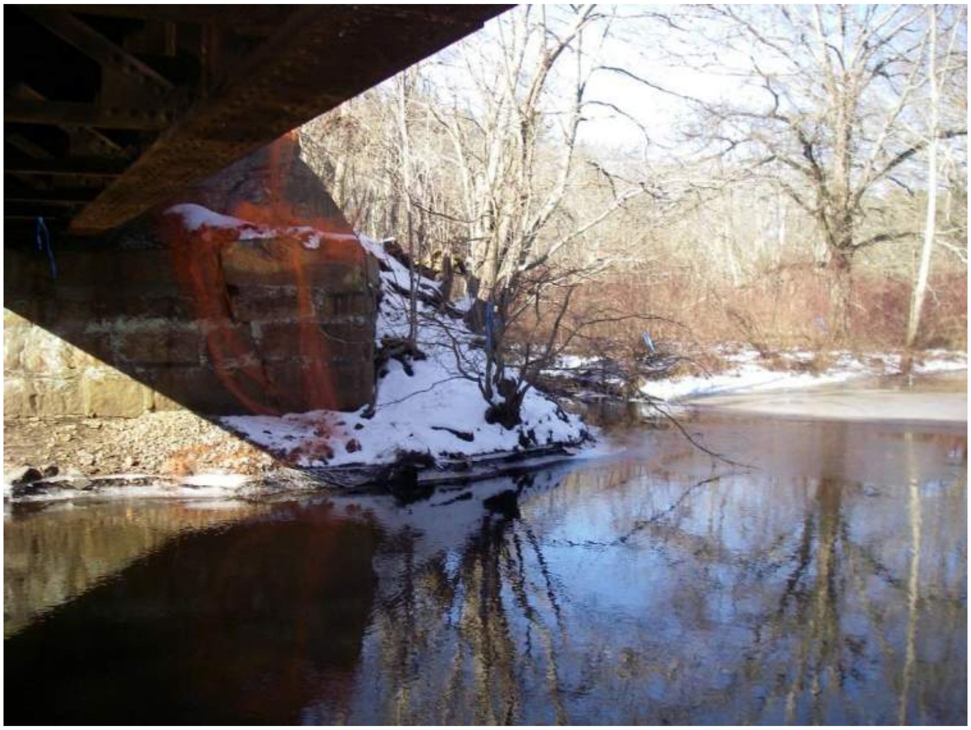
# APPENDIX A:

## Existing Site Photos

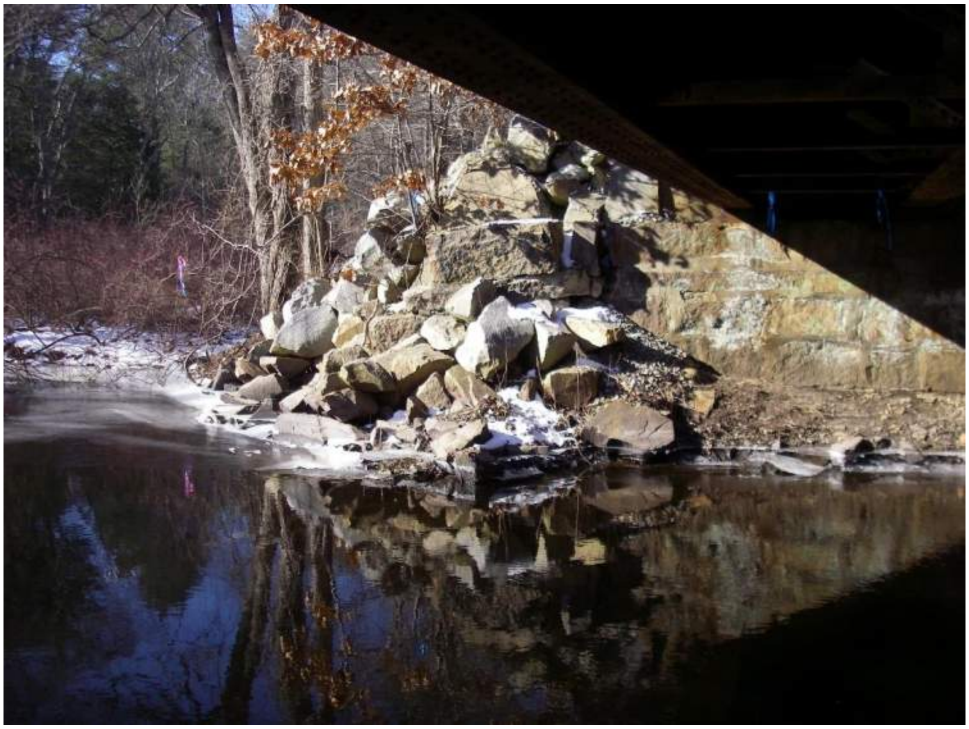
Looking east across Bridge N-23-029



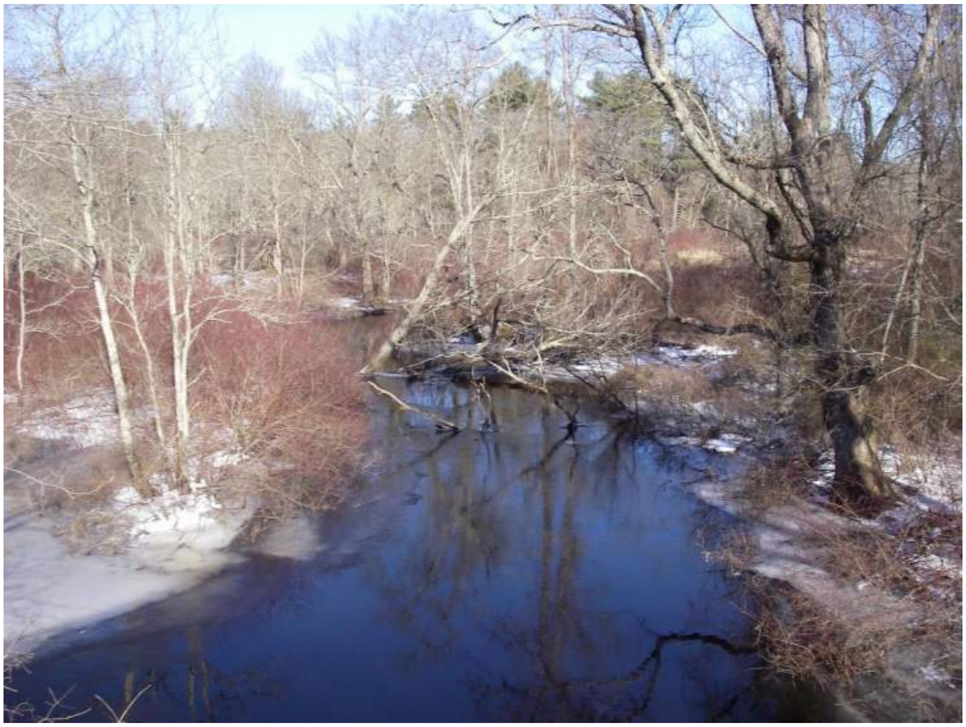
East abutment



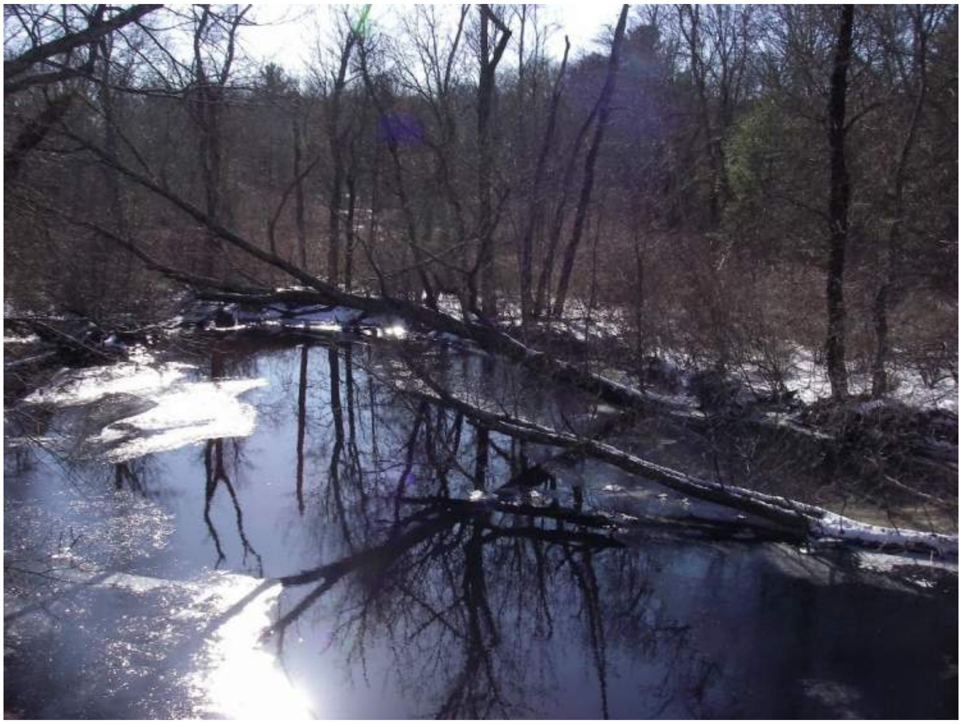
Northwest quadrant of the bridge



Southwest quadrant of the bridge



Looking north from the bridge



Looking south from the bridge

# APPENDIX B:

## USGS StreamStats Data Collection Report for Station Number 01109060

# StreamStats Data-Collection Station Report

| | |
|---|---|
| **USGS Station Number** | **01109060** |
| **Station Name** | **THREEMILE RIVER AT NORTH DIGHTON, MA** |

Click here to link to available data on NWIS-Web for this site.
Click here to link to available Iowa stream flow statistics.
Click here to link to available flow-duration statistics by period of record, calendar day and month, and selected seasonal periods.

## Descriptive Information

| | |
|---|---|
| Station Type | Streamgage, continuous record |
| Location | |
| Gage | |
| Regulation and Diversions | |
| Regulated? | False |
| Period of Record | 1966-present |
| Remarks | Diversions to and from basin may be compensating. |
| Latitude (degrees NAD83) | 41.8662122 |
| Longitude (degrees NAD83) | -71.1228236 |
| Hydrologic unit code | 01090004 |
| County | 005-Bristol |
| HCDN2009 | No |

## Physical Characteristics

| Characteristic Name | Value | Units | Citation Number |
|---|---|---|---|
| ***Descriptive Information*** | | | |
| State_Code | 25 | dimensionless | 30 |
| High_Flow_Regression_Equation | Y | Yes or No | 323 |
| Datum_of_Latitude_Longitude | NAD83 | dimensionless | 30 |
| District_Code | 25 | dimensionless | 30 |
| Begin_date_of_record | 7/1/1966 | days | 41 |
| End_date_of_record | 9/30/2003 | days | 41 |
| Number_of_days_of_record | 13606 | days | 41 |
| Number_of_days_GT_0 | 13606 | days | 41 |
| ***Topographical Characteristics*** | | | |
| Mean_Basin_Elevation | 170 | feet | 30 |
| Mean_Basin_Slope_ft_per_mi | 12.3 | feet per mi | 30 |
| ***Land Cover Characteristics*** | | | |
| Area_of_Lakes_and_Ponds | 1.7 | square miles | 30 |
| ***Stream Channel Properties*** | | | |
| Total_Stream_Length | 27.1 | miles | 30 |
| ***Basin Dimensional Characteristics*** | | | |
| Drainage_Area | 84.3 | square miles | 30 |

## Streamflow Statistics

| Statistic Name | Value | Units | Citation Number | Preferred? | Years of Record | Standard Error, percent | Variance log-10 | Lower 95% Confidence Interval | Upper 95% Confidence Interval | Start Date | End Date | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Peak-Flow Statistics*** | | | | | | | | | | | | |
| Mean_Annual_Flood | 700 | cubic feet per second | 28 | Y | | | | | | | | |
| 2_Year_Peak_Flood | 1065 | cubic feet per second | 323 | Y | 47 | 6.92 | 0.0009 | | | 10/1/1967 | 9/30/2013 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5_Year_Peak_Flood | 1565 | cubic feet per second | 323 | Y | 47 | 7.99 | 0.0012 | 10/1/1967 | 9/30/2013 |
| 10_Year_Peak_Flood | 1919 | cubic feet per second | 323 | Y | 47 | 9.23 | 0.0016 | 10/1/1967 | 9/30/2013 |
| 25_Year_Peak_Flood | 2393 | cubic feet per second | 323 | Y | 47 | 11.55 | 0.0025 | 10/1/1967 | 9/30/2013 |
| 50_Year_Peak_Flood | 2763 | cubic feet per second | 323 | Y | 47 | 13.49 | 0.0034 | 10/1/1967 | 9/30/2013 |
| 100_Year_Peak_Flood | 3147 | cubic feet per second | 323 | Y | 47 | 15.71 | 0.0046 | 10/1/1967 | 9/30/2013 |
| 200_Year_Peak_Flood | 3549 | cubic feet per second | 323 | Y | 47 | 17.98 | 0.006 | 10/1/1967 | 9/30/2013 |
| 500_Year_Peak_Flood | 4108 | cubic feet per second | 323 | Y | 47 | 21.21 | 0.0083 | 10/1/1967 | 9/30/2013 |
| Regression_2_Year_Peak_Flood | 977 | cubic feet per second | 323 | Y | | 42.27 | 0.031 | | |
| Regression_5_Year_Peak_Flood | 1550 | cubic feet per second | 323 | Y | | 43 | 0.032 | | |
| Regression_10_Year_Peak_Flood | 1980 | cubic feet per second | 323 | Y | | 44.44 | 0.034 | | |
| Regression_25_Year_Peak_Flood | 2600 | cubic feet per second | 323 | Y | | 47.24 | 0.038 | | |
| Regression_50_Year_Peak_Flood | 3100 | cubic feet per second | 323 | Y | | 49.28 | 0.041 | | |
| Regression_100_Year_Peak_Flood | 3620 | cubic feet per second | 323 | Y | | 51.91 | 0.045 | | |
| Regression_200_Year_Peak_Flood | 4180 | cubic feet per second | 323 | Y | | 53.83 | 0.048 | | |
| Regression_500_Year_Peak_Flood | 4970 | cubic feet per second | 323 | Y | | 57.58 | 0.054 | | |
| Weighted_5_Year_Peak_Flood | 1560 | cubic feet per second | 323 | Y | | 7.84 | 0.00116 | | |
| Weighted_10_Year_Peak_Flood | 1920 | cubic feet per second | 323 | Y | | 7.85 | 0.00153 | | |
| Weighted_25_Year_Peak_Flood | 2410 | cubic feet per second | 323 | Y | | 11.2 | 0.00235 | | |
| Weighted_50_Year_Peak_Flood | 2790 | cubic feet per second | 323 | Y | | 12.96 | 0.00314 | | |
| Weighted_100_Year_Peak_Flood | 3190 | cubic feet per second | 323 | Y | | 14.95 | 0.00417 | | |
| Weighted_200_Year_Peak_Flood | 3610 | cubic feet per second | 323 | Y | | 16.93 | 0.00533 | | |
| Weighted_500_Year_Peak_Flood | 4210 | cubic feet per second | 323 | Y | | 19.71 | 0.00719 | | |
| Systematic_peak_years | 47 | years | 323 | N | | | | | |
| Peak_years_with_historic_adjustment | 47 | years | 323 | N | | | | | |
| Weighted_2_Year_Peak_Flood | 1060 | cubic feet per second | 323 | Y | | 6.82 | 0.00087 | | |
| Mean_square_error_WRC_skew | 0.1243 | Log base 10 squared | 323 | N | | | | | |
| Weighted_Skew | 0.078 | Log base 10 | 323 | N | | | | | |
| EMA_Skew_of_Logs_of_Annual_Peaks | -0.221 | Log base 10 | 323 | N | | | | | |
| ***Low-Flow Statistics*** | | | | | | | | | |
| 7_Day_2_Year_Low_Flow | 18.1 | cubic feet per second | 23 | Y | | | | | |
| 7_Day_10_Year_Low_Flow | 9.4 | cubic feet per second | 23 | Y | | | | | |
| ***Flow-Duration Statistics*** | | | | | | | | | |
| 1_Percent_Duration | 863 | cubic feet per second | 325 | Y | 49 | | | 10/1/1966 | 9/30/2015 |
| 2_Percent_Duration | 692 | cubic feet per second | 325 | Y | 49 | | | 10/1/1966 | 9/30/2015 |
| 3_Percent_Duration | 604 | cubic feet per second | 325 | Y | 49 | | | 10/1/1966 | 9/30/2015 |
| 5_Percent_Duration | 505 | cubic feet per second | 325 | Y | 49 | | | 10/1/1966 | 9/30/2015 |
| 10_Percent_Duration | 382 | cubic feet per second | 325 | Y | 49 | | | 10/1/1966 | 9/30/2015 |
| 15_Percent_Duration | 309 | cubic feet per second | 325 | Y | 49 | | | 10/1/1966 | 9/30/2015 |
| 20_Percent_Duration | 259 | cubic feet per second | 325 | Y | 49 | | | 10/1/1966 | 9/30/2015 |
| 25_Percent_Duration | 223 | cubic feet per | 325 | Y | 49 | | | 10/1/1966 | 9/30/2015 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | second | | | | | | |
| 30_Percent_Duration | 194 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 35_Percent_Duration | 170 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 40_Percent_Duration | 150 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 45_Percent_Duration | 131 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 50_Percent_Duration | 114 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 55_Percent_Duration | 99 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 60_Percent_Duration | 84 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 65_Percent_Duration | 71 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 70_Percent_Duration | 57 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 75_Percent_Duration | 46 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 80_Percent_Duration | 37 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 85_Percent_Duration | 29 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 90_Percent_Duration | 22 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 95_Percent_Duration | 14 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 97_Percent_Duration | 11 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 98_Percent_Duration | 9.9 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| 99_Percent_Duration | 7.9 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| ***Annual Flow Statistics*** | | | | | | | | |
| Mean_Annual_Flow | 169 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Stand_Dev_of_Mean_Annual_Flow | 45 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Maximum_Annual_Mean_Flow | 267 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Minimum_Annual_Mean_Flow | 64 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| ***General Flow Statistics*** | | | | | | | | |
| Minimum_daily_flow | 1.3 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Maximum_daily_flow | 2680 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Std_Dev_of_daily_flows | 183 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Average_daily_streamflow | 164.972 | cubic feet per second | 41 | Y | 38 | | | |
| Harmonic_Mean_Streamflow | 53 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Mean_of_Logs_of_Daily_Values | 2.001895 | Log base 10 | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Std_Dev_of_Logs_of_Daily_Values | 0.473728 | Log base 10 | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Skew_of_Logs_of_Daily_Values | -0.320945 | Log base 10 | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| Non_Zero_Adjusted_Harmonic_Mean_Flow | 53 | cubic feet per second | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |
| ***Base Flow Statistics*** | | | | | | | | |
| Number_of_years_to_compute_BFI | 37 | years | 42 | Y | 38 | | | |
| Average_BFI_value | 0.611 | dimensionless | 42 | Y | 38 | | | |
| Std_dev_of_annual_BFI_values | 0.06 | dimensionless | 42 | Y | 38 | | | |
| ***Probabillity Statistics*** | | | | | | | | |
| Probability_flow_durations_are_zero | 0 | dimensionless | 325 | Y | 49 | | 10/1/1966 | 9/30/2015 |

## Citations

| *Citation Number* | *Citation Name and URL* |
|---|---|

| | |
|---|---|
| 23 | Wandle, S.W., Jr., and Keezer, G.R., 1984, Gazetteer of Hydrologic Characteristics of Streams in Massachusetts--Taunton and Ten Mile River Basins and Coastal River Basins of Mount Hope Bay, Narragansett Bay, and Rhode Island Sound: U.S. Geological Survey Water-Resources Investigations Report 84-4283 |
| 28 | Williams, J.R., Farrell, D.F., and Willey, R.E., 1973, Water Resources of the Tauton River Basin, Southeastern Massachusetts: U.S. Geological Survey Hydrologic Investigations Atlas HA-460 |
| 30 | Imported from NWIS file |
| 41 | Wolock, D.M., 2003, Flow characteristics at U.S. Geological Survey streamgages in the conterminous United States: U.S. Geological Survey Open-File Report 03-146, digital data set |
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| 323 | Zarriello, P.J., 2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016�5156, 99 p. |
| 325 | Granato G.E., Ries, K.G., III, and Steeves, P.A., 2017, Compilation of streamflow statistics calculated from daily mean streamflow data collected during water years 1901�2015 for selected U.S. Geological Survey streamgages: U.S. Geological Survey Open-File Report 2017-1108, 17 p. |

# APPENDIX C:

## USGS Ungaged Site Regression Calculations

**Table 3–1C.** US-DS Flow worksheet—Equations for improving estimates of flood flows, within certain limits, at an ungaged site on a stream upstream (US) or downstream (DS) from a gaged location in Massachusetts.

## 2-Year Flow

[Flood flows on a stream above or below a gaged location, within certain limits, can be improved by a weighted area of the gaged site flood-flow values and the ungaged regional regression flow value]

| | |
|---|---|
| 🟨 | Yellow designates cells where user input is required |

| | | |
|---|---|---|
| Return | 2 | Year |
| $DA_u$ | 72.7 | Drainage area at ungaged site, $mi^2$ |
| $DA_g$ | 84.3 | Drainage area at gage site, $mi^2$ |
| $Q_{P(g)w}$ | 1,060 | Flood magnitude determined from weighted at-site analysis (gage site), $ft^3/s$ |
| $Q_{P(g)r}$ | 977 | Flood magnitude determined from regional regression at gage site, $ft^3/s$ |
| $Q_{P(u)r}$ | 875 | Flood magnitude determined from regional regression at ungaged site, $ft^3/s$ |
| Delta A | -11.6 | Drainage area difference, $mi^2$ |
| DA Ratio | 0.86 | **OK- DA within range** |
| AVP | 0.0310 | Regional regression average variance of prediction |
| $V_{wgt}$ | 0.0053 | Weighted at site variance |
| $V_{P(g)}$ | 0.006 | variance at-site esitmate |

| **Return** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** |
|---|---|---|---|---|---|---|---|---|
| **% AEP** | **50** | **20** | **10** | **4** | **2** | **1** | **0.5** | **0.2** |
| **AVP** | 0.031 | 0.033 | 0.034 | 0.038 | 0.041 | 0.045 | 0.048 | 0.054 |

**Method by Ries and others (2007) Modified**

| | | |
|---|---|---|
| coeffcient | 0.80 | Values can be obtained from table to right |
| $Q_{P(u)w}$ | 923 | Weighted peak at ungaged site |

| **% AEP** | **Return** | **DA exponent** | **Intercept** | **Pseudo-$r^2$** | **Average standard error or prediction (%)** |
|---|---|---|---|---|---|
| 50 | 2 | 0.80 | 1.631 | 93.3 | 42.3 |
| 20 | 5 | 0.79 | 1.851 | 92.7 | 43.4 |
| 10 | 10 | 0.78 | 1.969 | 92.1 | 44.7 |
| 4 | 25 | 0.78 | 2.098 | 91.1 | 47.1 |
| 2 | 50 | 0.77 | 2.182 | 90.1 | 49.4 |
| 1 | 100 | 0.77 | 2.256 | 89.0 | 51.8 |
| 0.5 | 200 | 0.76 | 2.325 | 87.9 | 54.1 |
| 0.2 | 500 | 0.76 | 2.408 | 86.2 | 57.6 |
| | average | 0.77 | | | |
| | median | 0.77 | | | |

**Reference cited:**

Ries, K.G. III, comp., 2007, The national streamflow statistics program—A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Survey Techniques and Methods, book 4, chap. A6, 37 p., http://pubs.er.usgs.gov/publication/tm4A6.

Weighted ungaged site estimate

$$Q_{P(u)g} = \left(\frac{DA_u}{DA_g}\right)^b Q_{P(g)w}$$

$$Q_{P(u)w} = \left(\frac{2\Delta DA}{DA_g}\right) Q_{P(u)r} + \left(1 - \frac{2\Delta DA}{DA_g}\right) Q_{P(u)g}$$

where

| | |
|---|---|
| $Q_{P(u)g}$ | is the scaled flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second; |
| $DA_{(u)}$ | is the drainage area at the ungaged site, in square miles, |
| $DA_{(g)}$ | is the drainage area at the gaged site, in square miles, |
| $b$ | is the exponent of drainage area from the appropriate regression equations, |
| $Q_{P(g)w}$ | is the weighted (WIE) flow estimate for the selected *P*-percent AEP at the gaged site, in cubic feet per second, and |
| $Q_{P(u)r}$ | is the regional regression flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second. |

**Table 3–1C.** US-DS Flow worksheet—Equations for improving estimates of flood flows, within certain limits, at an ungaged site on a stream upstream (US) or downstream (DS) from a gaged location in Massachusetts.

## 5-Year Flow

[Flood flows on a stream above or below a gaged location, within certain limits, can be improved by a weighted area of the gaged site flood-flow values and the ungaged regional regression flow value]

🟨 Yellow designates cells where user input is required

| | | |
|---|---|---|
| Return | 5 | Year |
| $DA_u$ | 72.7 | Drainage area at ungaged site, mi$^2$ |
| $DA_g$ | 84.3 | Drainage area at gage site, mi$^2$ |
| $Q_{P(g)w}$ | 1,560 | Flood magnitude determined from weighted at-site analysis (gage site), ft$^3$/s |
| $Q_{P(g)r}$ | 1,550 | Flood magnitude determined from regional regression at gage site, ft$^3$/s |
| $Q_{P(u)r}$ | 1,390 | Flood magnitude determined from regional regression at ungaged site, ft$^3$/s |
| Delta A | -11.6 | Drainage area difference, mi$^2$ |
| DA Ratio | 0.86 | **OK- DA within range** |
| AVP | 0.0330 | Regional regression average variance of prediction |
| $V_{wgt}$ | 0.0053 | Weighted at site variance |
| $V_{P(g)}$ | 0.006 | variance at-site esitmate |

| **Return** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** |
|---|---|---|---|---|---|---|---|---|
| **% AEP** | **50** | **20** | **10** | **4** | **2** | **1** | **0.5** | **0.2** |
| **AVP** | 0.031 | 0.033 | 0.034 | 0.038 | 0.041 | 0.045 | 0.048 | 0.054 |

| % AEP | Return | DA exponent | Intercept | Pseudo-r$^2$ | Average standard error or prediction (%) |
|---|---|---|---|---|---|
| 50 | 2 | 0.80 | 1.631 | 93.3 | 42.3 |
| 20 | 5 | 0.79 | 1.851 | 92.7 | 43.4 |
| 10 | 10 | 0.78 | 1.969 | 92.1 | 44.7 |
| 4 | 25 | 0.78 | 2.098 | 91.1 | 47.1 |
| 2 | 50 | 0.77 | 2.182 | 90.1 | 49.4 |
| 1 | 100 | 0.77 | 2.256 | 89.0 | 51.8 |
| 0.5 | 200 | 0.76 | 2.325 | 87.9 | 54.1 |
| 0.2 | 500 | 0.76 | 2.408 | 86.2 | 57.6 |
| | average | 0.77 | | | |
| | median | 0.77 | | | |

**Method by Ries and others (2007) Modified**

| | | |
|---|---|---|
| coeffcient | 0.79 | Values can be obtained from table to right |
| $Q_{P(u)w}$ | 1,389 | Weighted peak at ungaged site |

**Reference cited:**

Ries, K.G. III, comp., 2007, The national streamflow statistics program—A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Survey Techniques and Methods, book 4, chap. A6, 37 p., http://pubs.er.usgs.gov/publication/tm4A6.

Weighted ungaged site estimate

$$Q_{P(u)g} = \left(\frac{DA_u}{DA_g}\right)^b Q_{P(g)w}$$

$$Q_{P(u)w} = \left(\frac{2\Delta DA}{DA_g}\right) Q_{P(u)r} + \left(1 - \frac{2\Delta DA}{DA_g}\right) Q_{P(u)g}$$

where

| | |
|---|---|
| $Q_{P(u)g}$ | is the scaled flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second; |
| $DA_{(u)}$ | is the drainage area at the ungaged site, in square miles, |
| $DA_{(g)}$ | is the drainage area at the gaged site, in square miles, |
| $b$ | is the exponent of drainage area from the appropriate regression equations, |
| $Q_{P(g)w}$ | is the weighted (WIE) flow estimate for the selected *P*-percent AEP at the gaged site, in cubic feet per second, and |
| $Q_{P(u)r}$ | is the regional regression flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second. |

**Table 3–1C.** US-DS Flow worksheet—Equations for improving estimates of flood flows, within certain limits, at an ungaged site on a stream upstream (US) or downstream (DS) from a gaged location in Massachusetts.

## 10-Year Flow

[Flood flows on a stream above or below a gaged location, within certain limits, can be improved by a weighted area of the gaged site flood-flow values and the ungaged regional regression flow value]

|  |  |  |
|---|---|---|
|  |  | Yellow designates cells where user input is required |
| Return | 10 | Year |
| $DA_u$ | 72.7 | Drainage area at ungaged site, $mi^2$ |
| $DA_g$ | 84.3 | Drainage area at gage site, $mi^2$ |
| $Q_{P(g)w}$ | 1,920 | Flood magnitude determined from weighted at-site analysis (gage site), $ft^3/s$ |
| $Q_{P(g)r}$ | 1,980 | Flood magnitude determined from regional regression at gage site, $ft^3/s$ |
| $Q_{P(u)r}$ | 1,780 | Flood magnitude determined from regional regression at ungaged site, $ft^3/s$ |
| Delta A | -11.6 | Drainage area difference, $mi^2$ |
| DA Ratio | 0.86 | **OK- DA within range** |
| AVP | 0.0340 | Regional regression average variance of prediction |
| $V_{wgt}$ | 0.0053 | Weighted at site variance |
| $V_{P(g)}$ | 0.006 | variance at-site esitmate |

| **Return** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** |
|---|---|---|---|---|---|---|---|---|
| **% AEP** | **50** | **20** | **10** | **4** | **2** | **1** | **0.5** | **0.2** |
| **AVP** | 0.031 | 0.033 | 0.034 | 0.038 | 0.041 | 0.045 | 0.048 | 0.054 |

| **% AEP** | **Return** | **DA exponent** | **Intercept** | **Pseudo-$r^2$** | **Average standard error or prediction (%)** |
|---|---|---|---|---|---|
| 50 | 2 | 0.80 | 1.631 | 93.3 | 42.3 |
| 20 | 5 | 0.79 | 1.851 | 92.7 | 43.4 |
| 10 | 10 | 0.78 | 1.969 | 92.1 | 44.7 |
| 4 | 25 | 0.78 | 2.098 | 91.1 | 47.1 |
| 2 | 50 | 0.77 | 2.182 | 90.1 | 49.4 |
| 1 | 100 | 0.77 | 2.256 | 89.0 | 51.8 |
| 0.5 | 200 | 0.76 | 2.325 | 87.9 | 54.1 |
| 0.2 | 500 | 0.76 | 2.408 | 86.2 | 57.6 |
|  | average | 0.77 |  |  |  |
|  | median | 0.77 |  |  |  |

**Method by Ries and others (2007) Modified**

|  |  |  |
|---|---|---|
| coeffcient | 0.78 | Values can be obtained from table to right |
| $Q_{P(u)w}$ | 1,729 | Weighted peak at ungaged site |

**Reference cited:**

Ries, K.G. III, comp., 2007, The national streamflow statistics program—A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Survey Techniques and Methods, book 4, chap. A6, 37 p., http://pubs.er.usgs.gov/publication/tm4A6.

Weighted ungaged site estimate

$$Q_{P(u)g} = \left(\frac{DA_u}{DA_g}\right)^b Q_{P(g)w}$$

$$Q_{P(u)w} = \left(\frac{2\Delta DA}{DA_g}\right) Q_{P(u)r} + \left(1 - \frac{2\Delta DA}{DA_g}\right) Q_{P(u)g}$$

where

|  |  |
|---|---|
| $Q_{P(u)g}$ | is the scaled flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second; |
| $DA_{(u)}$ | is the drainage area at the ungaged site, in square miles, |
| $DA_{(g)}$ | is the drainage area at the gaged site, in square miles, |
| $b$ | is the exponent of drainage area from the appropriate regression equations, |
| $Q_{P(g)w}$ | is the weighted (WIE) flow estimate for the selected *P*-percent AEP at the gaged site, in cubic feet per second, and |
| $Q_{P(u)r}$ | is the regional regression flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second. |

**Table 3–1C.** US-DS Flow worksheet—Equations for improving estimates of flood flows, within certain limits, at an ungaged site on a stream upstream (US) or downstream (DS) from a gaged location in Massachusetts.

## 25-Year Flow

[Flood flows on a stream above or below a gaged location, within certain limits, can be improved by a weighted area of the gaged site flood-flow values and the ungaged regional regression flow value]

🟨 Yellow designates cells where user input is required

| | | |
|---|---|---|
| Return | 25 | Year |
| $DA_u$ | 72.7 | Drainage area at ungaged site, $mi^2$ |
| $DA_g$ | 84.3 | Drainage area at gage site, $mi^2$ |
| $Q_{P(g)w}$ | 2,410 | Flood magnitude determined from weighted at-site analysis (gage site), $ft^3/s$ |
| $Q_{P(g)r}$ | 2,600 | Flood magnitude determined from regional regression at gage site, $ft^3/s$ |
| $Q_{P(u)r}$ | 2,340 | Flood magnitude determined from regional regression at ungaged site, $ft^3/s$ |
| Delta A | -11.6 | Drainage area difference, $mi^2$ |
| DA Ratio | 0.86 | **OK- DA within range** |
| AVP | 0.0380 | Regional regression average variance of prediction |
| $V_{wgt}$ | 0.0053 | Weighted at site variance |
| $V_{P(g)}$ | 0.006 | variance at-site esitmate |

| **Return** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** |
|---|---|---|---|---|---|---|---|---|
| **% AEP** | **50** | **20** | **10** | **4** | **2** | **1** | **0.5** | **0.2** |
| **AVP** | 0.031 | 0.033 | 0.034 | 0.038 | 0.041 | 0.045 | 0.048 | 0.054 |

**Method by Ries and others (2007) Modified**

| | | |
|---|---|---|
| coeffcient | 0.78 | Values can be obtained from table to right |
| $Q_{P(u)w}$ | 2,201 | Weighted peak at ungaged site |

| % AEP | Return | DA exponent | Intercept | Pseudo-$r^2$ | Average standard error or prediction (%) |
|---|---|---|---|---|---|
| 50 | 2 | 0.80 | 1.631 | 93.3 | 42.3 |
| 20 | 5 | 0.79 | 1.851 | 92.7 | 43.4 |
| 10 | 10 | 0.78 | 1.969 | 92.1 | 44.7 |
| 4 | 25 | 0.78 | 2.098 | 91.1 | 47.1 |
| 2 | 50 | 0.77 | 2.182 | 90.1 | 49.4 |
| 1 | 100 | 0.77 | 2.256 | 89.0 | 51.8 |
| 0.5 | 200 | 0.76 | 2.325 | 87.9 | 54.1 |
| 0.2 | 500 | 0.76 | 2.408 | 86.2 | 57.6 |
| | average | 0.77 | | | |
| | median | 0.77 | | | |

**Reference cited:**

Ries, K.G. III, comp., 2007, The national streamflow statistics program—A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Survey Techniques and Methods, book 4, chap. A6, 37 p., http://pubs.er.usgs.gov/publication/tm4A6.

Weighted ungaged site estimate

$$Q_{P(u)g} = \left(\frac{DA_u}{DA_g}\right)^b Q_{P(g)w}$$

$$Q_{P(u)w} = \left(\frac{2\Delta DA}{DA_g}\right) Q_{P(u)r} + \left(1 - \frac{2\Delta DA}{DA_g}\right) Q_{P(u)g}$$

where

| | |
|---|---|
| $Q_{P(u)g}$ | is the scaled flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second; |
| $DA_{(u)}$ | is the drainage area at the ungaged site, in square miles, |
| $DA_{(g)}$ | is the drainage area at the gaged site, in square miles, |
| $b$ | is the exponent of drainage area from the appropriate regression equations, |
| $Q_{P(g)w}$ | is the weighted (WIE) flow estimate for the selected *P*-percent AEP at the gaged site, in cubic feet per second, and |
| $Q_{P(u)r}$ | is the regional regression flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second. |

**Table 3–1C.** US-DS Flow worksheet—Equations for improving estimates of flood flows, within certain limits, at an ungaged site on a stream upstream (US) or downstream (DS) from a gaged location in Massachusetts.

**50-Year Flow**

[Flood flows on a stream above or below a gaged location, within certain limits, can be improved by a weighted area of the gaged site flood-flow values and the ungaged regional regression flow value]

|  |  |  |
|---|---|---|
|  | 🟨 | Yellow designates cells where user input is required |
| Return | 50 | Year |
| $DA_u$ | 72.7 | Drainage area at ungaged site, $mi^2$ |
| $DA_g$ | 84.3 | Drainage area at gage site, $mi^2$ |
| $Q_{P(g)w}$ | 2,790 | Flood magnitude determined from weighted at-site analysis (gage site), $ft^3/s$ |
| $Q_{P(g)r}$ | 3,100 | Flood magnitude determined from regional regression at gage site, $ft^3/s$ |
| $Q_{P(u)r}$ | 2,800 | Flood magnitude determined from regional regression at ungaged site, $ft^3/s$ |
| Delta A | -11.6 | Drainage area difference, $mi^2$ |
| DA Ratio | 0.86 | **OK- DA within range** |
| AVP | 0.0410 | Regional regression average variance of prediction |
| $V_{wgt}$ | 0.0053 | Weighted at site variance |
| $V_{P(g)}$ | 0.006 | variance at-site esitmate |

| **Return** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** |
|---|---|---|---|---|---|---|---|---|
| **% AEP** | **50** | **20** | **10** | **4** | **2** | **1** | **0.5** | **0.2** |
| **AVP** | 0.031 | 0.033 | 0.034 | 0.038 | 0.041 | 0.045 | 0.048 | 0.054 |

**Method by Ries and others (2007) Modified**

|  |  |  |
|---|---|---|
| coeffcient | 0.77 | Values can be obtained from table to right |
| $Q_{P(u)w}$ | 2,575 | Weighted peak at ungaged site |

| % AEP | Return | DA exponent | Intercept | Pseudo-$r^2$ | Average standard error or prediction (%) |
|---|---|---|---|---|---|
| 50 | 2 | 0.80 | 1.631 | 93.3 | 42.3 |
| 20 | 5 | 0.79 | 1.851 | 92.7 | 43.4 |
| 10 | 10 | 0.78 | 1.969 | 92.1 | 44.7 |
| 4 | 25 | 0.78 | 2.098 | 91.1 | 47.1 |
| 2 | 50 | 0.77 | 2.182 | 90.1 | 49.4 |
| 1 | 100 | 0.77 | 2.256 | 89.0 | 51.8 |
| 0.5 | 200 | 0.76 | 2.325 | 87.9 | 54.1 |
| 0.2 | 500 | 0.76 | 2.408 | 86.2 | 57.6 |
|  | average | 0.77 |  |  |  |
|  | median | 0.77 |  |  |  |

**Reference cited:**

Ries, K.G. III, comp., 2007, The national streamflow statistics program—A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Survey Techniques and Methods, book 4, chap. A6, 37 p., http://pubs.er.usgs.gov/publication/tm4A6.

Weighted ungaged site estimate

$$Q_{P(u)g} = \left(\frac{DA_u}{DA_g}\right)^b Q_{P(g)w}$$

$$Q_{P(u)w} = \left(\frac{2\Delta DA}{DA_g}\right) Q_{P(u)r} + \left(1 - \frac{2\Delta DA}{DA_g}\right) Q_{P(u)g}$$

where

|  |  |
|---|---|
| $Q_{P(u)g}$ | is the scaled flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second; |
| $DA_{(u)}$ | is the drainage area at the ungaged site, in square miles, |
| $DA_{(g)}$ | is the drainage area at the gaged site, in square miles, |
| $b$ | is the exponent of drainage area from the appropriate regression equations, |
| $Q_{P(g)w}$ | is the weighted (WIE) flow estimate for the selected *P*-percent AEP at the gaged site, in cubic feet per second, and |
| $Q_{P(u)r}$ | is the regional regression flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second. |

**Table 3–1C.** US-DS Flow worksheet—Equations for improving estimates of flood flows, within certain limits, at an ungaged site on a stream upstream (US) or downstream (DS) from a gaged location in Massachusetts.

**100-Year Flow**

[Flood flows on a stream above or below a gaged location, within certain limits, can be improved by a weighted area of the gaged site flood-flow values and the ungaged regional regression flow value]

| | | |
|---|---|---|
| | | Yellow designates cells where user input is required |
| Return | 100 | Year |
| $DA_u$ | 72.7 | Drainage area at ungaged site, $mi^2$ |
| $DA_g$ | 84.3 | Drainage area at gage site, $mi^2$ |
| $Q_{P(g)w}$ | 3,190 | Flood magnitude determined from weighted at-site analysis (gage site), $ft^3/s$ |
| $Q_{P(g)r}$ | 3,620 | Flood magnitude determined from regional regression at gage site, $ft^3/s$ |
| $Q_{P(u)r}$ | 3,270 | Flood magnitude determined from regional regression at ungaged site, $ft^3/s$ |
| Delta A | -11.6 | Drainage area difference, $mi^2$ |
| DA Ratio | 0.86 | **OK- DA within range** |
| AVP | 0.0450 | Regional regression average variance of prediction |
| $V_{wgt}$ | 0.0053 | Weighted at site variance |
| $V_{P(g)}$ | 0.006 | variance at-site esitmate |

| **Return** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** |
|---|---|---|---|---|---|---|---|---|
| **% AEP** | **50** | **20** | **10** | **4** | **2** | **1** | **0.5** | **0.2** |
| **AVP** | 0.031 | 0.033 | 0.034 | 0.038 | 0.041 | 0.045 | 0.048 | 0.054 |

**Method by Ries and others (2007) Modified**

| | | |
|---|---|---|
| coeffcient | 0.77 | Values can be obtained from table to right |
| $Q_{P(u)w}$ | 2,964 | Weighted peak at ungaged site |

| **% AEP** | **Return** | **DA exponent** | **Intercept** | **Pseudo-$r^2$** | **Average standard error or prediction (%)** |
|---|---|---|---|---|---|
| 50 | 2 | 0.80 | 1.631 | 93.3 | 42.3 |
| 20 | 5 | 0.79 | 1.851 | 92.7 | 43.4 |
| 10 | 10 | 0.78 | 1.969 | 92.1 | 44.7 |
| 4 | 25 | 0.78 | 2.098 | 91.1 | 47.1 |
| 2 | 50 | 0.77 | 2.182 | 90.1 | 49.4 |
| 1 | 100 | 0.77 | 2.256 | 89.0 | 51.8 |
| 0.5 | 200 | 0.76 | 2.325 | 87.9 | 54.1 |
| 0.2 | 500 | 0.76 | 2.408 | 86.2 | 57.6 |
| | average | 0.77 | | | |
| | median | 0.77 | | | |

**Reference cited:**

Ries, K.G. III, comp., 2007, The national streamflow statistics program—A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Survey Techniques and Methods, book 4, chap. A6, 37 p., http://pubs.er.usgs.gov/publication/tm4A6.

Weighted ungaged site estimate

$$Q_{P(u)g} = \left(\frac{DA_u}{DA_g}\right)^b Q_{P(g)w}$$

$$Q_{P(u)w} = \left(\frac{2\Delta DA}{DA_g}\right) Q_{P(u)r} + \left(1 - \frac{2\Delta DA}{DA_g}\right) Q_{P(u)g}$$

where

| | |
|---|---|
| $Q_{P(u)g}$ | is the scaled flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second; |
| $DA_{(u)}$ | is the drainage area at the ungaged site, in square miles, |
| $DA_{(g)}$ | is the drainage area at the gaged site, in square miles, |
| $b$ | is the exponent of drainage area from the appropriate regression equations, |
| $Q_{P(g)w}$ | is the weighted (WIE) flow estimate for the selected *P*-percent AEP at the gaged site, in cubic feet per second, and |
| $Q_{P(u)r}$ | is the regional regression flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second. |

**Table 3–1C.** US-DS Flow worksheet—Equations for improving estimates of flood flows, within certain limits, at an ungaged site on a stream upstream (US) or downstream (DS) from a gaged location in Massachusetts.

## 200-Year Flow

[Flood flows on a stream above or below a gaged location, within certain limits, can be improved by a weighted area of the gaged site flood-flow values and the ungaged regional regression flow value]

| | | |
|---|---|---|
| | ☐ | Yellow designates cells where user input is required |
| Return | 200 | Year |
| $DA_u$ | 72.7 | Drainage area at ungaged site, $mi^2$ |
| $DA_g$ | 84.3 | Drainage area at gage site, $mi^2$ |
| $Q_{P(g)w}$ | 3,610 | Flood magnitude determined from weighted at-site analysis (gage site), $ft^3/s$ |
| $Q_{P(g)r}$ | 4,180 | Flood magnitude determined from regional regression at gage site, $ft^3/s$ |
| $Q_{P(u)r}$ | 3,780 | Flood magnitude determined from regional regression at ungaged site, $ft^3/s$ |
| Delta A | -11.6 | Drainage area difference, $mi^2$ |
| DA Ratio | 0.86 | **OK- DA within range** |
| AVP | 0.0480 | Regional regression average variance of prediction |
| $V_{wgt}$ | 0.0053 | Weighted at site variance |
| $V_{P(g)}$ | 0.006 | variance at-site esitmate |

| **Return** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** |
|---|---|---|---|---|---|---|---|---|
| **% AEP** | **50** | **20** | **10** | **4** | **2** | **1** | **0.5** | **0.2** |
| **AVP** | 0.031 | 0.033 | 0.034 | 0.038 | 0.041 | 0.045 | 0.048 | 0.054 |

| % AEP | Return | DA exponent | Intercept | Pseudo-$r^2$ | Average standard error or prediction (%) |
|---|---|---|---|---|---|
| 50 | 2 | 0.80 | 1.631 | 93.3 | 42.3 |
| 20 | 5 | 0.79 | 1.851 | 92.7 | 43.4 |
| 10 | 10 | 0.78 | 1.969 | 92.1 | 44.7 |
| 4 | 25 | 0.78 | 2.098 | 91.1 | 47.1 |
| 2 | 50 | 0.77 | 2.182 | 90.1 | 49.4 |
| 1 | 100 | 0.77 | 2.256 | 89.0 | 51.8 |
| 0.5 | 200 | 0.76 | 2.325 | 87.9 | 54.1 |
| 0.2 | 500 | 0.76 | 2.408 | 86.2 | 57.6 |
| | average | 0.77 | | | |
| | median | 0.77 | | | |

**Method by Ries and others (2007) Modified**

| | | |
|---|---|---|
| coeffcient | 0.76 | Values can be obtained from table to right |
| $Q_{P(u)w}$ | 3,377 | Weighted peak at ungaged site |

**Reference cited:**

Ries, K.G. III, comp., 2007, The national streamflow statistics program—A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Survey Techniques and Methods, book 4, chap. A6, 37 p., http://pubs.er.usgs.gov/publication/tm4A6.

Weighted ungaged site estimate

$$Q_{P(u)g} = \left(\frac{DA_u}{DA_g}\right)^b Q_{P(g)w}$$

$$Q_{P(u)w} = \left(\frac{2\Delta DA}{DA_g}\right) Q_{P(u)r} + \left(1 - \frac{2\Delta DA}{DA_g}\right) Q_{P(u)g}$$

where

| | |
|---|---|
| $Q_{P(u)g}$ | is the scaled flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second; |
| $DA_{(u)}$ | is the drainage area at the ungaged site, in square miles, |
| $DA_{(g)}$ | is the drainage area at the gaged site, in square miles, |
| $b$ | is the exponent of drainage area from the appropriate regression equations, |
| $Q_{P(g)w}$ | is the weighted (WIE) flow estimate for the selected *P*-percent AEP at the gaged site, in cubic feet per second, and |
| $Q_{P(u)r}$ | is the regional regression flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second. |

**Table 3–1C.** US-DS Flow worksheet—Equations for improving estimates of flood flows, within certain limits, at an ungaged site on a stream upstream (US) or downstream (DS) from a gaged location in Massachusetts.

## 500-Year Flow

[Flood flows on a stream above or below a gaged location, within certain limits, can be improved by a weighted area of the gaged site flood-flow values and the ungaged regional regression flow value]

| | Yellow designates cells where user input is required |
|---|---|

| | | |
|---|---|---|
| Return | 500 | Year |
| $DA_u$ | 72.7 | Drainage area at ungaged site, $mi^2$ |
| $DA_g$ | 84.3 | Drainage area at gage site, $mi^2$ |
| $Q_{P(g)w}$ | 4,210 | Flood magnitude determined from weighted at-site analysis (gage site), $ft^3/s$ |
| $Q_{P(g)r}$ | 4,970 | Flood magnitude determined from regional regression at gage site, $ft^3/s$ |
| $Q_{P(u)r}$ | 4,490 | Flood magnitude determined from regional regression at ungaged site, $ft^3/s$ |
| Delta A | -11.6 | Drainage area difference, $mi^2$ |
| DA Ratio | 0.86 | **OK- DA within range** |
| AVP | 0.0540 | Regional regression average variance of prediction |
| $V_{wgt}$ | 0.0053 | Weighted at site variance |
| $V_{P(g)}$ | 0.006 | variance at-site esitmate |

| **Return** | **2** | **5** | **10** | **25** | **50** | **100** | **200** | **500** |
|---|---|---|---|---|---|---|---|---|
| **% AEP** | **50** | **20** | **10** | **4** | **2** | **1** | **0.5** | **0.2** |
| **AVP** | 0.031 | 0.033 | 0.034 | 0.038 | 0.041 | 0.045 | 0.048 | 0.054 |

| **% AEP** | **Return** | **DA exponent** | **Intercept** | **Pseudo-$r^2$** | **Average standard error or prediction (%)** |
|---|---|---|---|---|---|
| 50 | 2 | 0.80 | 1.631 | 93.3 | 42.3 |
| 20 | 5 | 0.79 | 1.851 | 92.7 | 43.4 |
| 10 | 10 | 0.78 | 1.969 | 92.1 | 44.7 |
| 4 | 25 | 0.78 | 2.098 | 91.1 | 47.1 |
| 2 | 50 | 0.77 | 2.182 | 90.1 | 49.4 |
| 1 | 100 | 0.77 | 2.256 | 89.0 | 51.8 |
| 0.5 | 200 | 0.76 | 2.325 | 87.9 | 54.1 |
| 0.2 | 500 | 0.76 | 2.408 | 86.2 | 57.6 |
| | average | 0.77 | | | |
| | median | 0.77 | | | |

**Method by Ries and others (2007) Modified**

| | | |
|---|---|---|
| coeffcient | 0.76 | Values can be obtained from table to right |
| $Q_{P(u)w}$ | 3,962 | Weighted peak at ungaged site |

**Reference cited:**

Ries, K.G. III, comp., 2007, The national streamflow statistics program—A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Survey Techniques and Methods, book 4, chap. A6, 37 p., http://pubs.er.usgs.gov/publication/tm4A6.

Weighted ungaged site estimate

$$Q_{P(u)g} = \left(\frac{DA_u}{DA_g}\right)^b Q_{P(g)w}$$

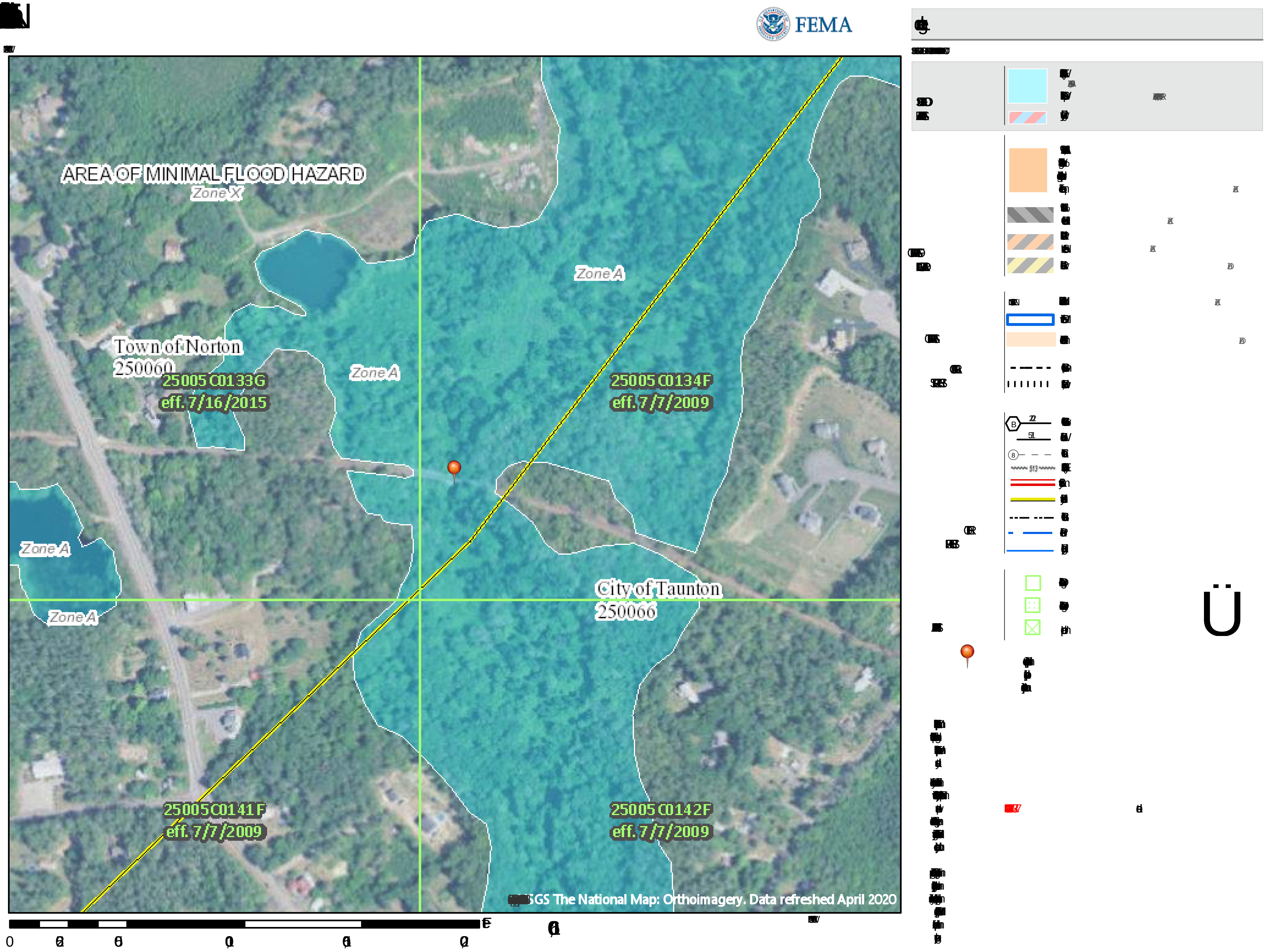
$$Q_{P(u)w} = \left(\frac{2\Delta DA}{DA_g}\right) Q_{P(u)r} + \left(1 - \frac{2\Delta DA}{DA_g}\right) Q_{P(u)g}$$

where

| | |
|---|---|
| $Q_{P(u)g}$ | is the scaled flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second; |
| $DA_{(u)}$ | is the drainage area at the ungaged site, in square miles, |
| $DA_{(g)}$ | is the drainage area at the gaged site, in square miles, |
| $b$ | is the exponent of drainage area from the appropriate regression equations, |
| $Q_{P(g)w}$ | is the weighted (WIE) flow estimate for the selected *P*-percent AEP at the gaged site, in cubic feet per second, and |
| $Q_{P(u)r}$ | is the regional regression flow estimate for the selected *P*-percent AEP at the ungaged site, in cubic feet per second. |

# APPENDIX D:

## FEMA FIRMETTE for Project Site


FEMA
AREA OF MINIMAL FLOOD HAZARD
Zone X
Zone A
Town of Norton
250060
25005C0133G
eff. 7/16/2015
Zone A
25005C0134F
eff. 7/7/2009
Zone A
Zone A
City of Taunton
250066
25005C0141F
eff. 7/7/2009
25005C0142F
eff. 7/7/2009
SGS The National Map: Orthoimagery. Data refreshed April 2020
0

# APPENDIX E:

## EXISTING HEC-RAS MODEL AND RESULTS

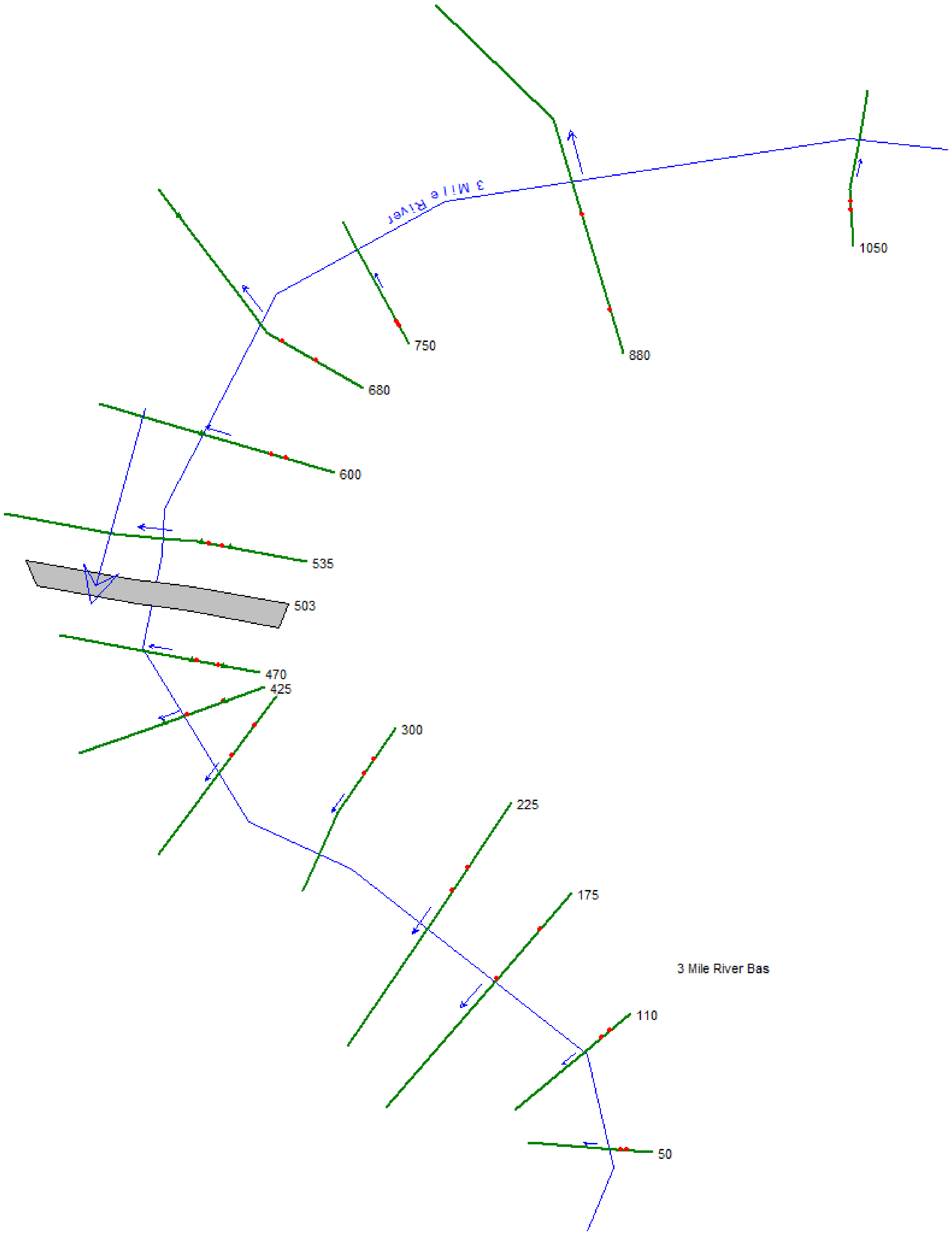
Geometry Plan

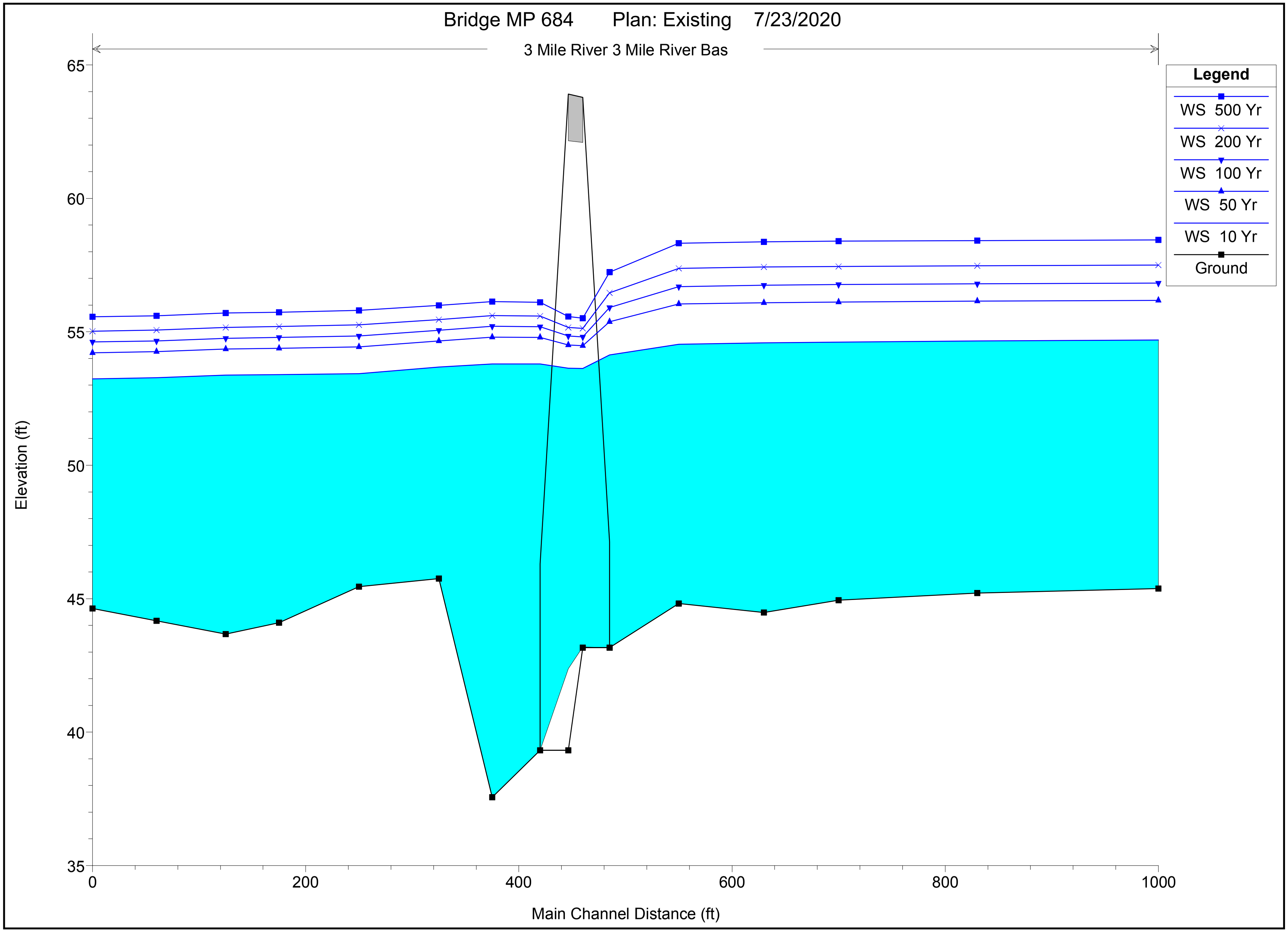
Stream Profile

Stream Cross Sections

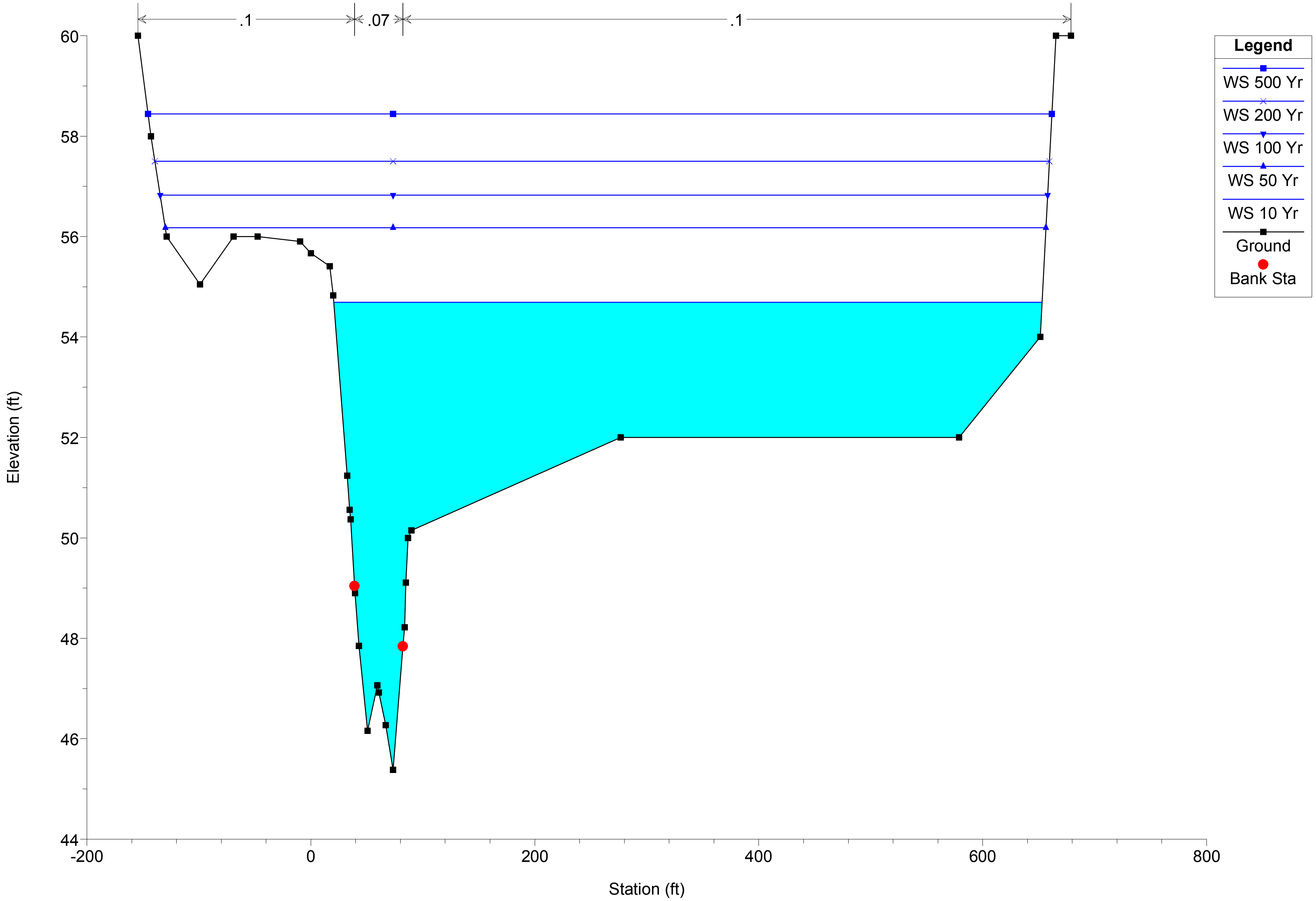
Cross Sections Output

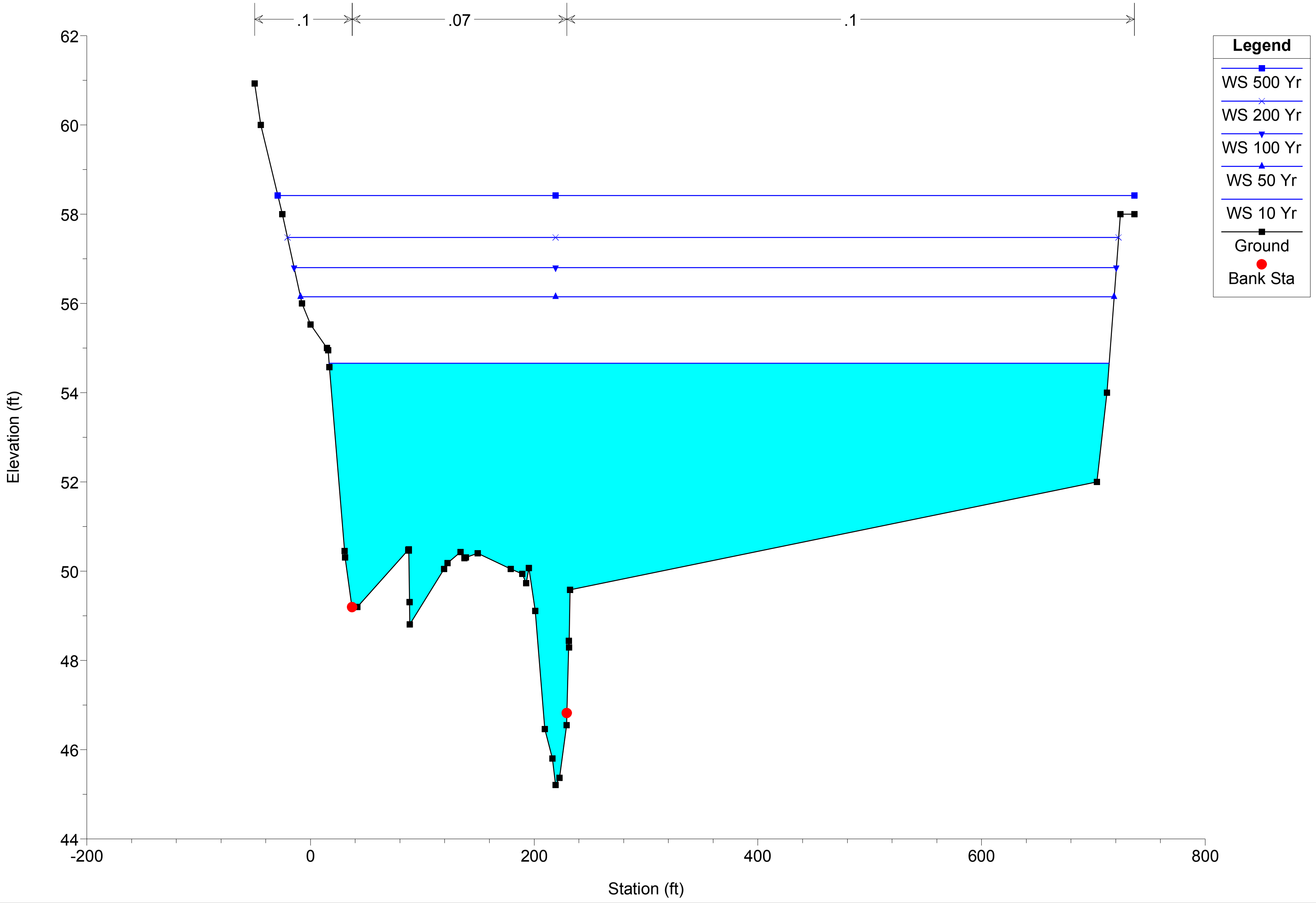
Detailed Bridge Output


3 Mile River
3 Mile River Bas


Bridge MP 684 Plan: Existing 7/23/2020
3 Mile River 3 Mile River Bas
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Elevation (ft)
65
60
55
50
45
40
35
0
200
400
600
800
1000
Main Channel Distance (ft)

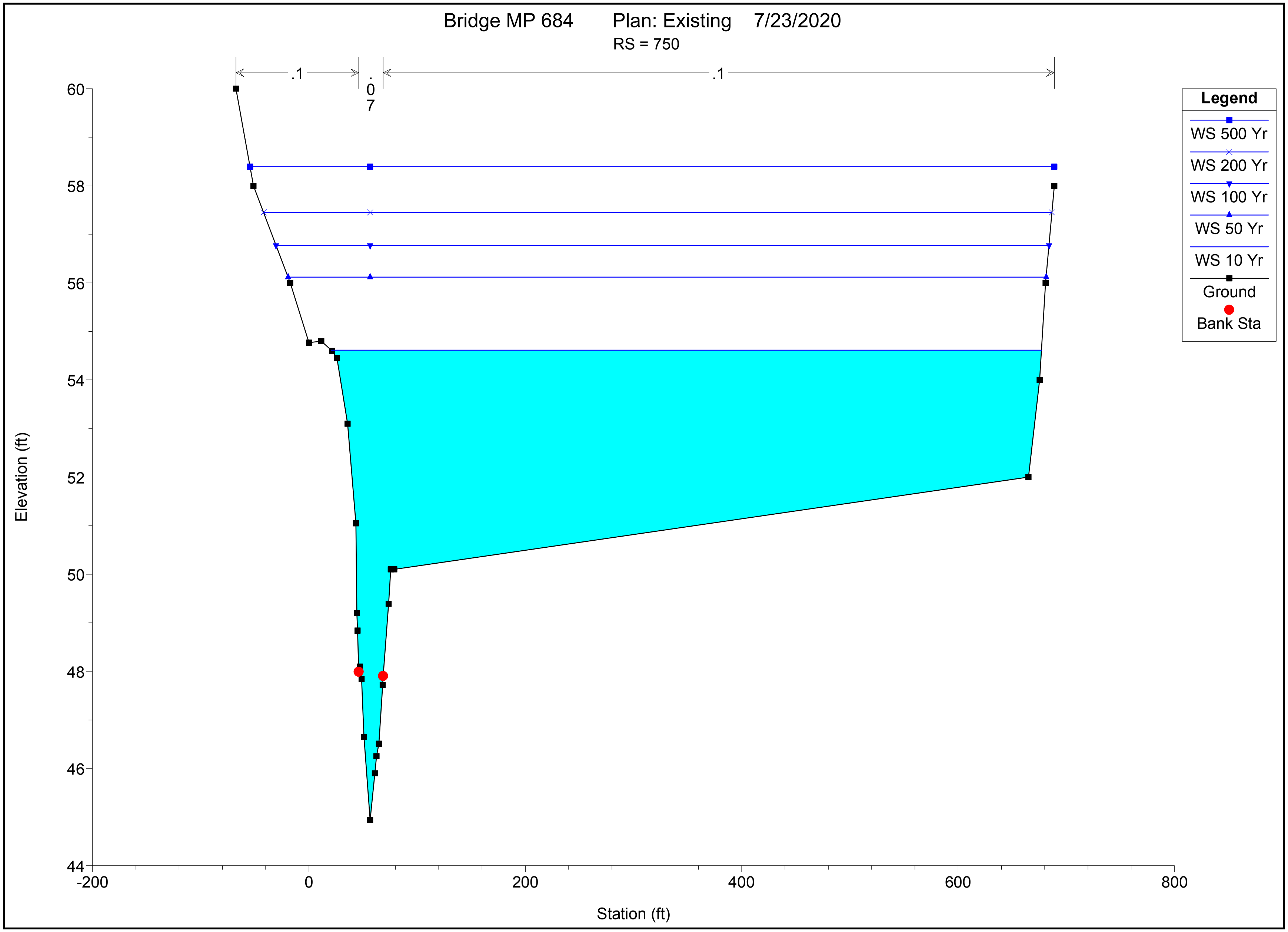
Bridge MP 684 Plan: Existing 7/23/2020
RS = 1050

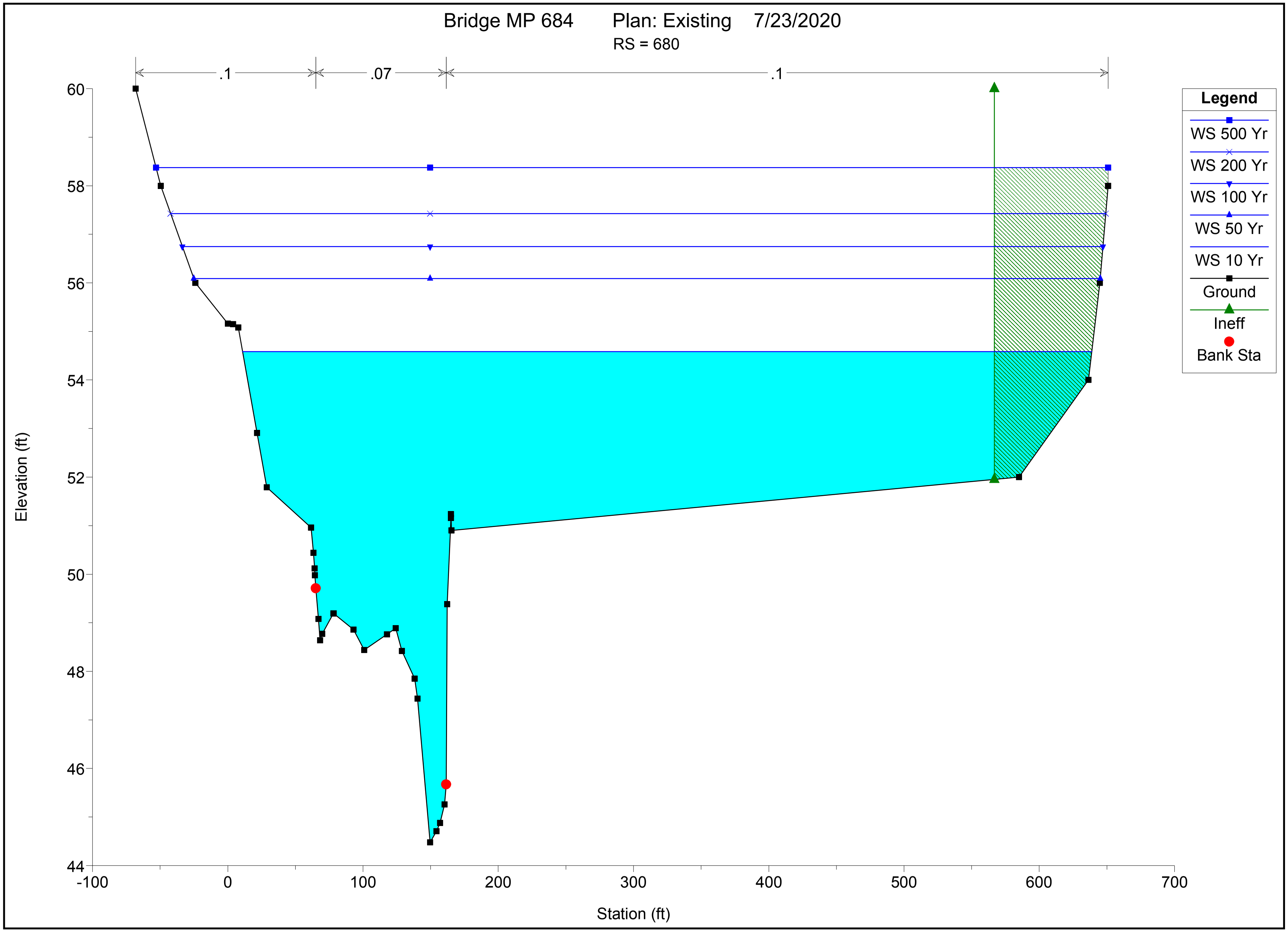


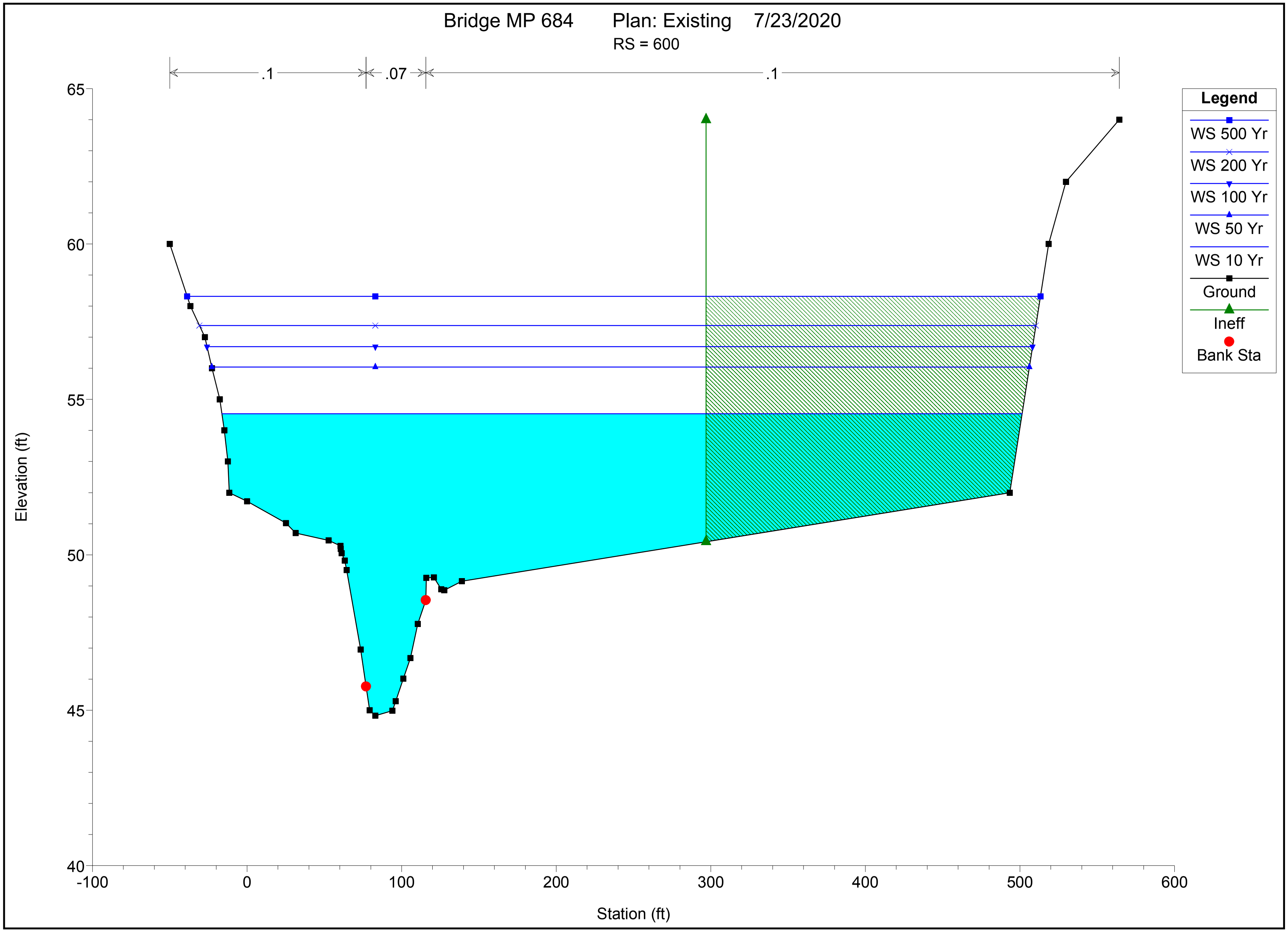


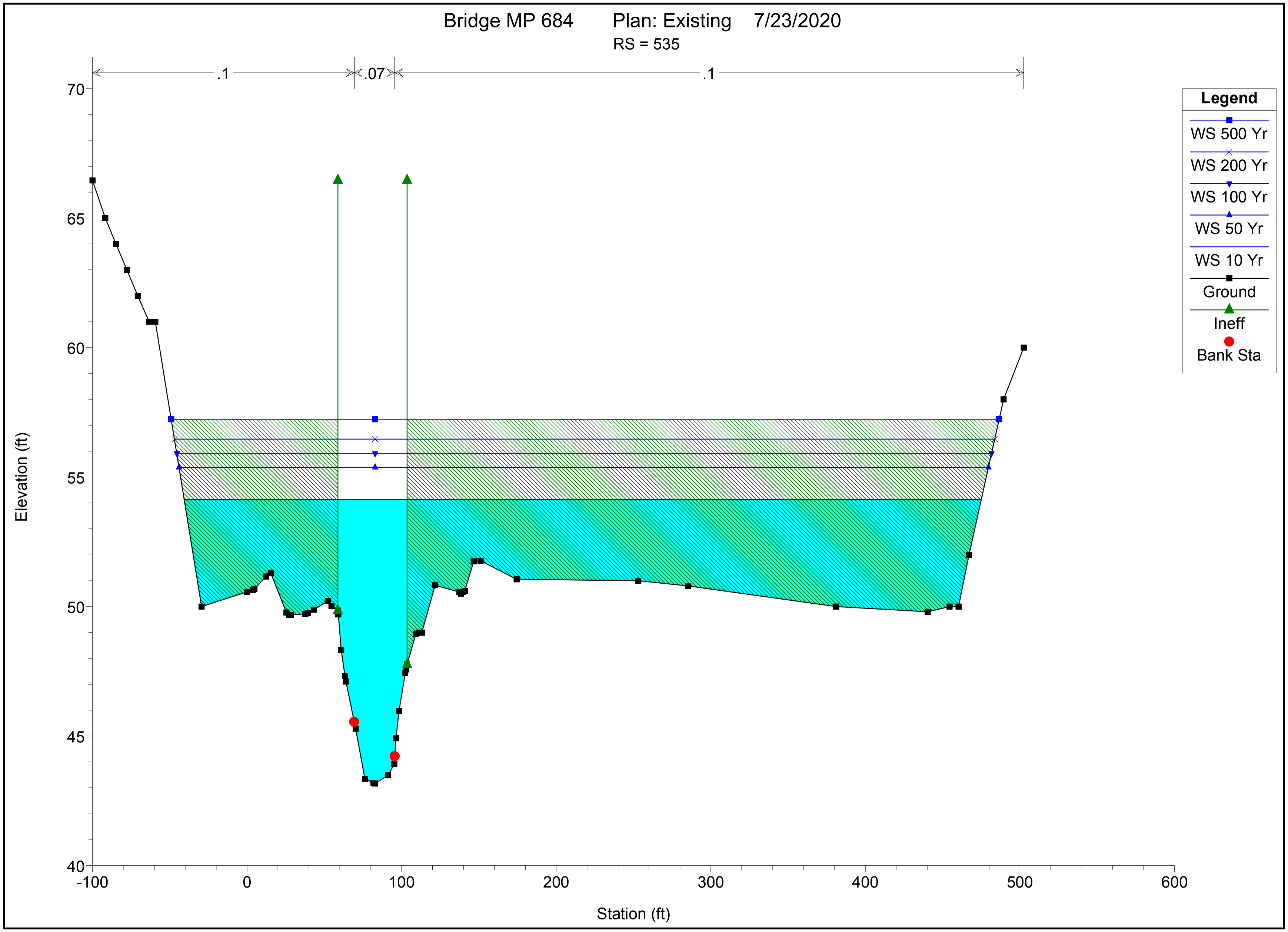
Bridge MP 684 Plan: Existing 7/23/2020

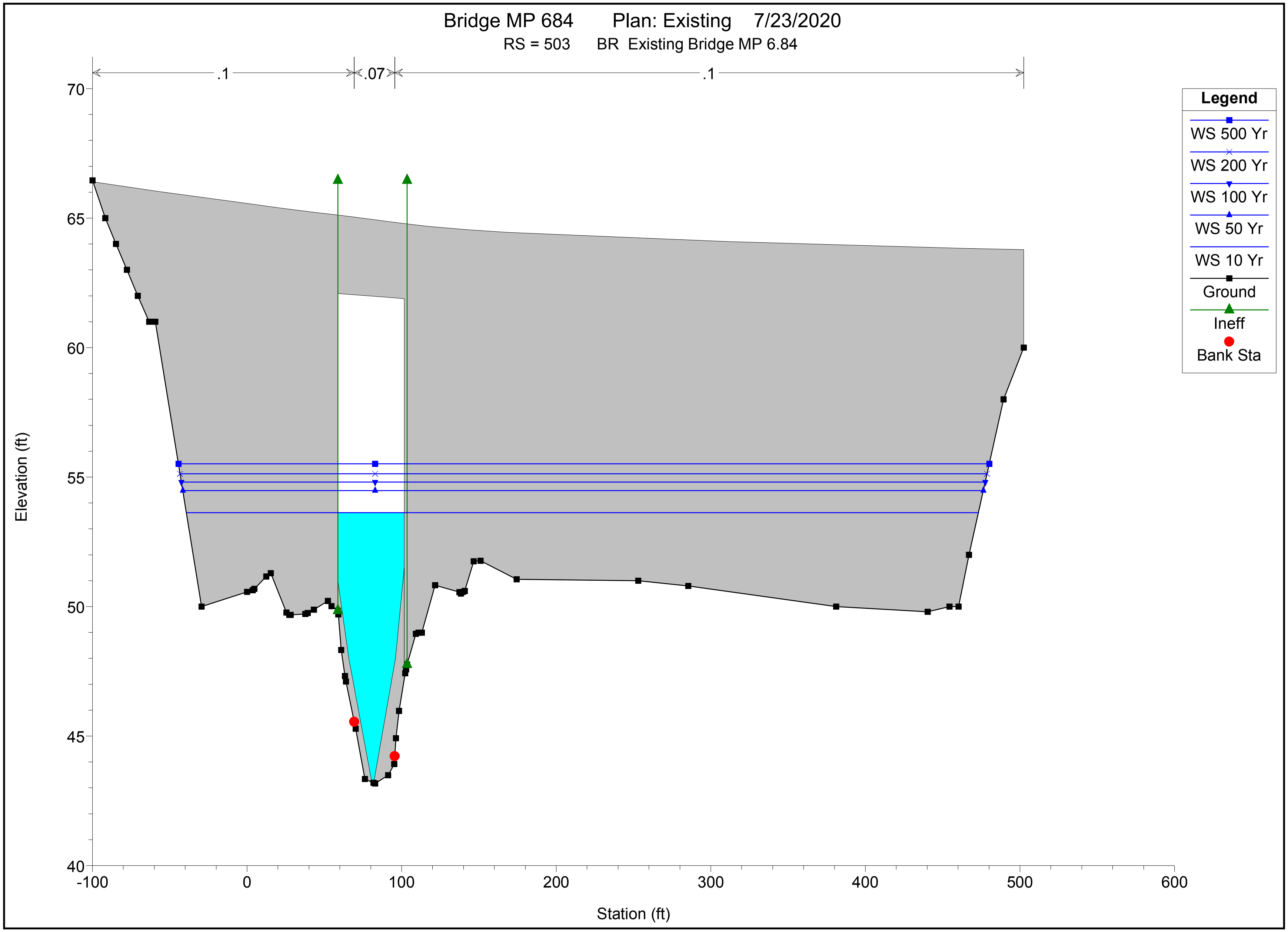
RS = 880

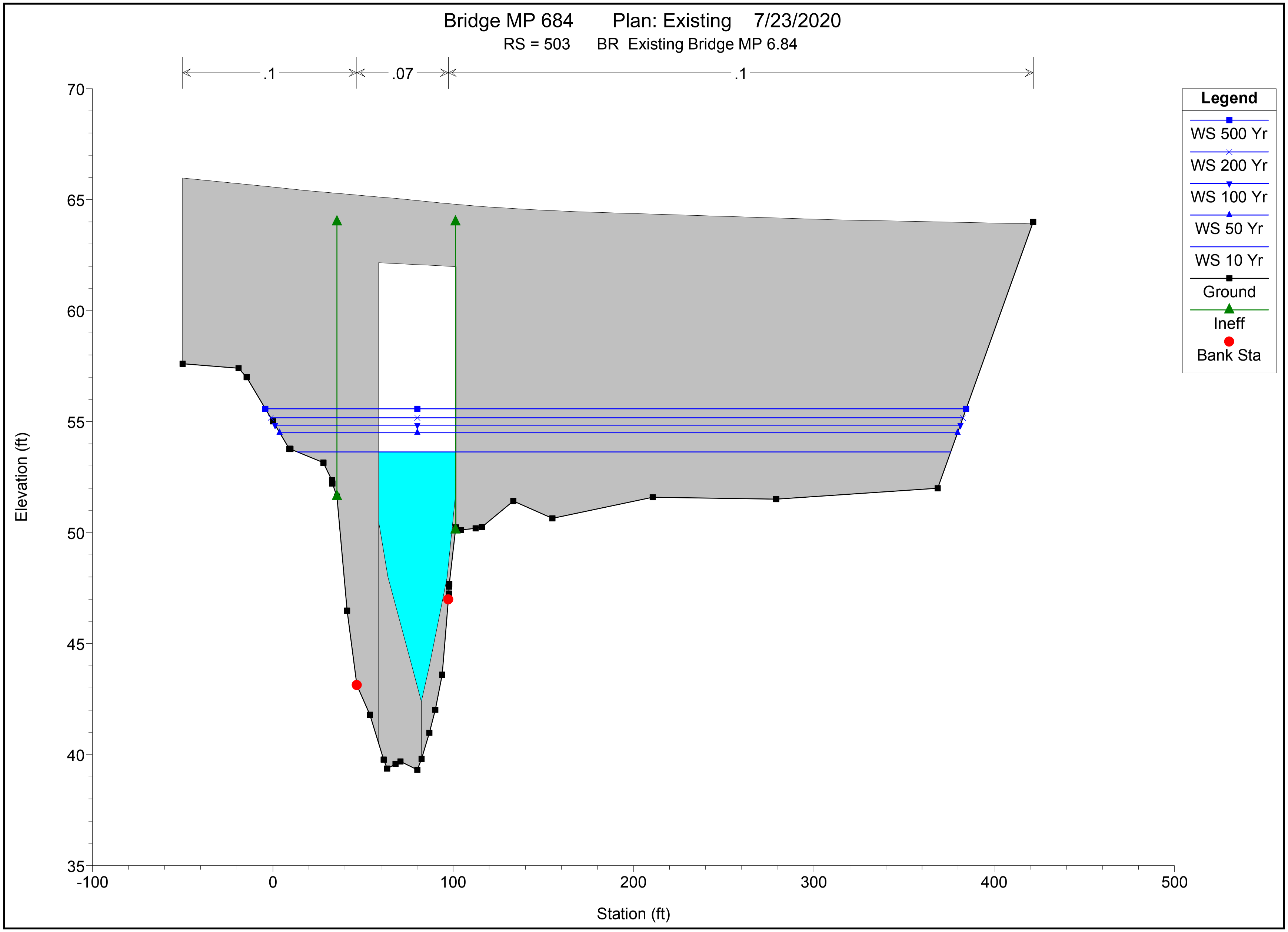

Bridge MP 684
Plan: Existing
7/23/2020
RS = 750
.1
.
0
7
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
60
58
56
54
52
50
48
46
44
-200
0
200
400
600
800
Station (ft)


Bridge MP 684
Plan: Existing
7/23/2020
RS = 680
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
60
58
56
54
52
50
48
46
44
Station (ft)
-100
0
100
200
300
400
500
600
700


Bridge MP 684 Plan: Existing 7/23/2020
RS = 600

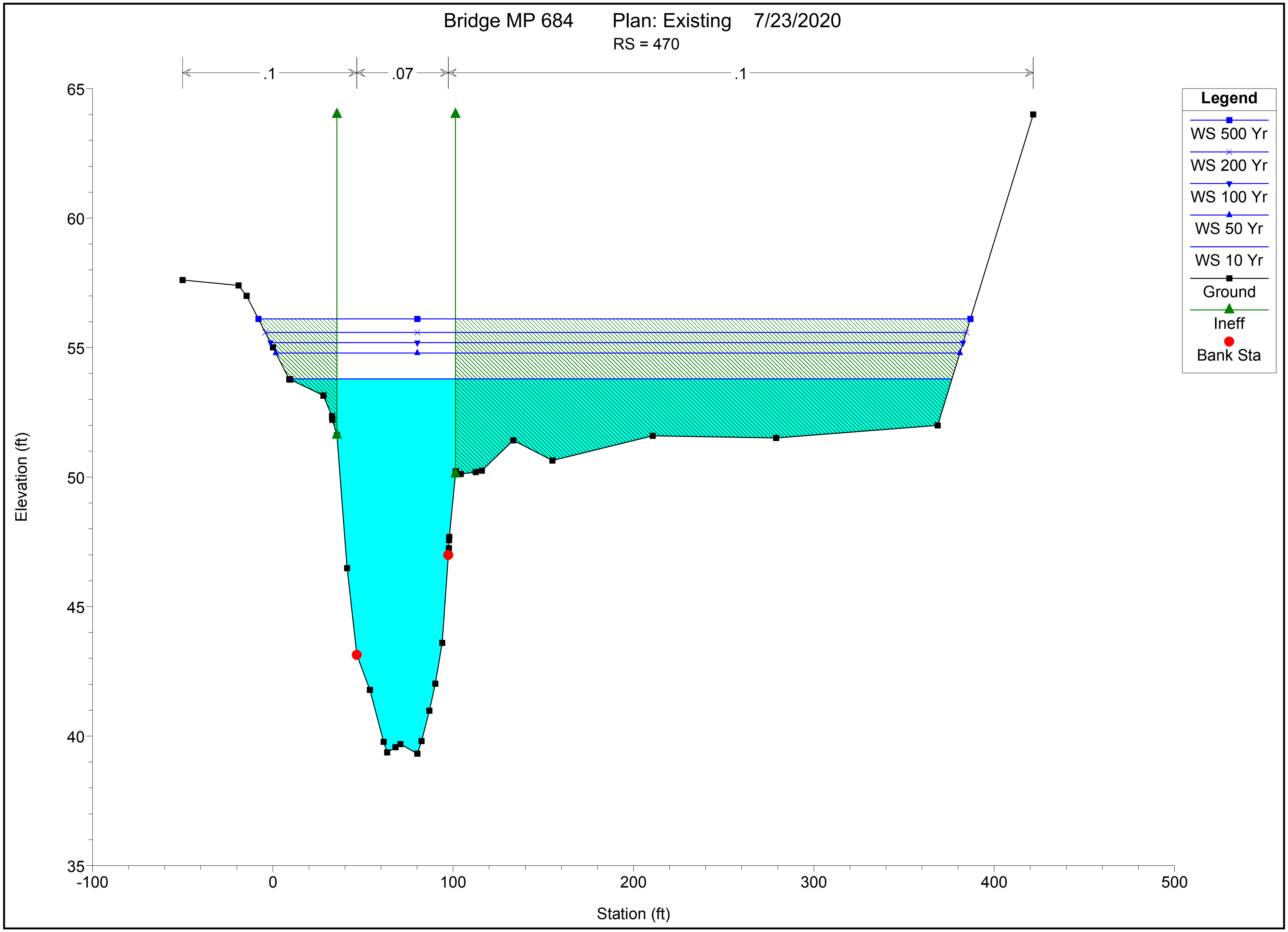

Bridge MP 684 Plan: Existing 7/23/2020
RS = 535
.1
.07
.1
Elevation (ft)
70
65
60
55
50
45
40
-100
0
100
200
300
400
500
600
Station (ft)
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Ineff
Bank Sta

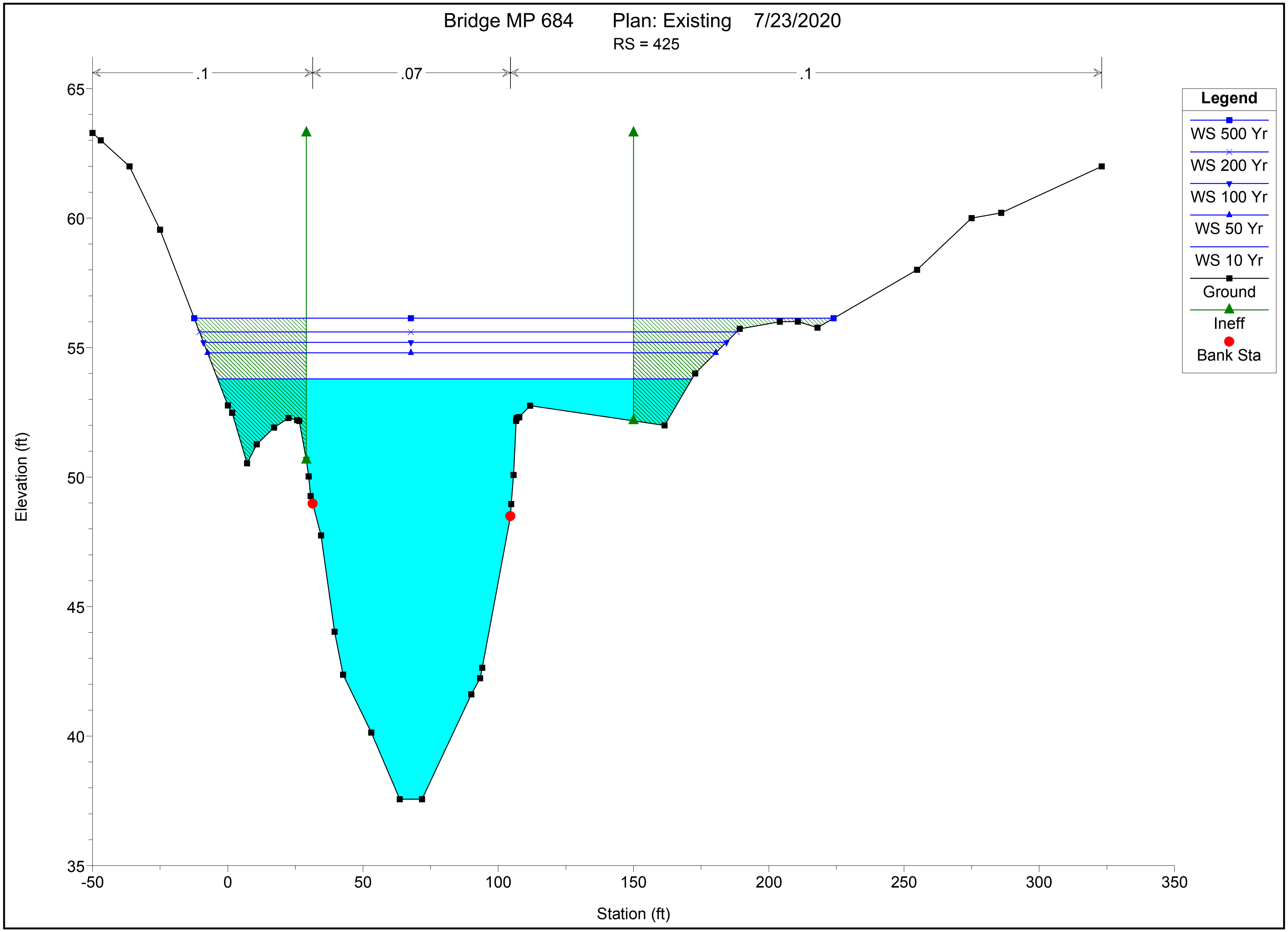

Bridge MP 684 Plan: Existing 7/23/2020
RS = 503 BR Existing Bridge MP 6.84

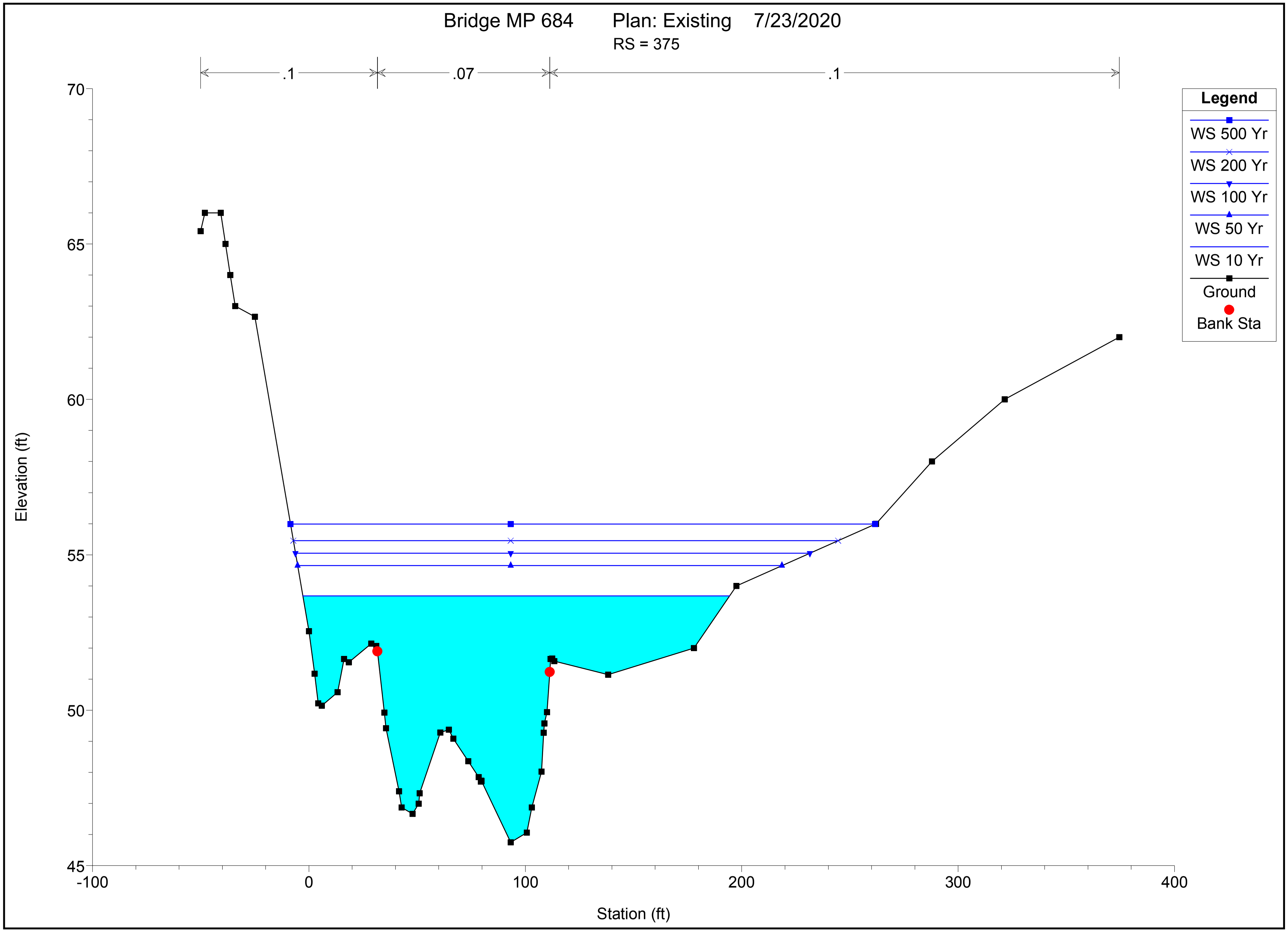


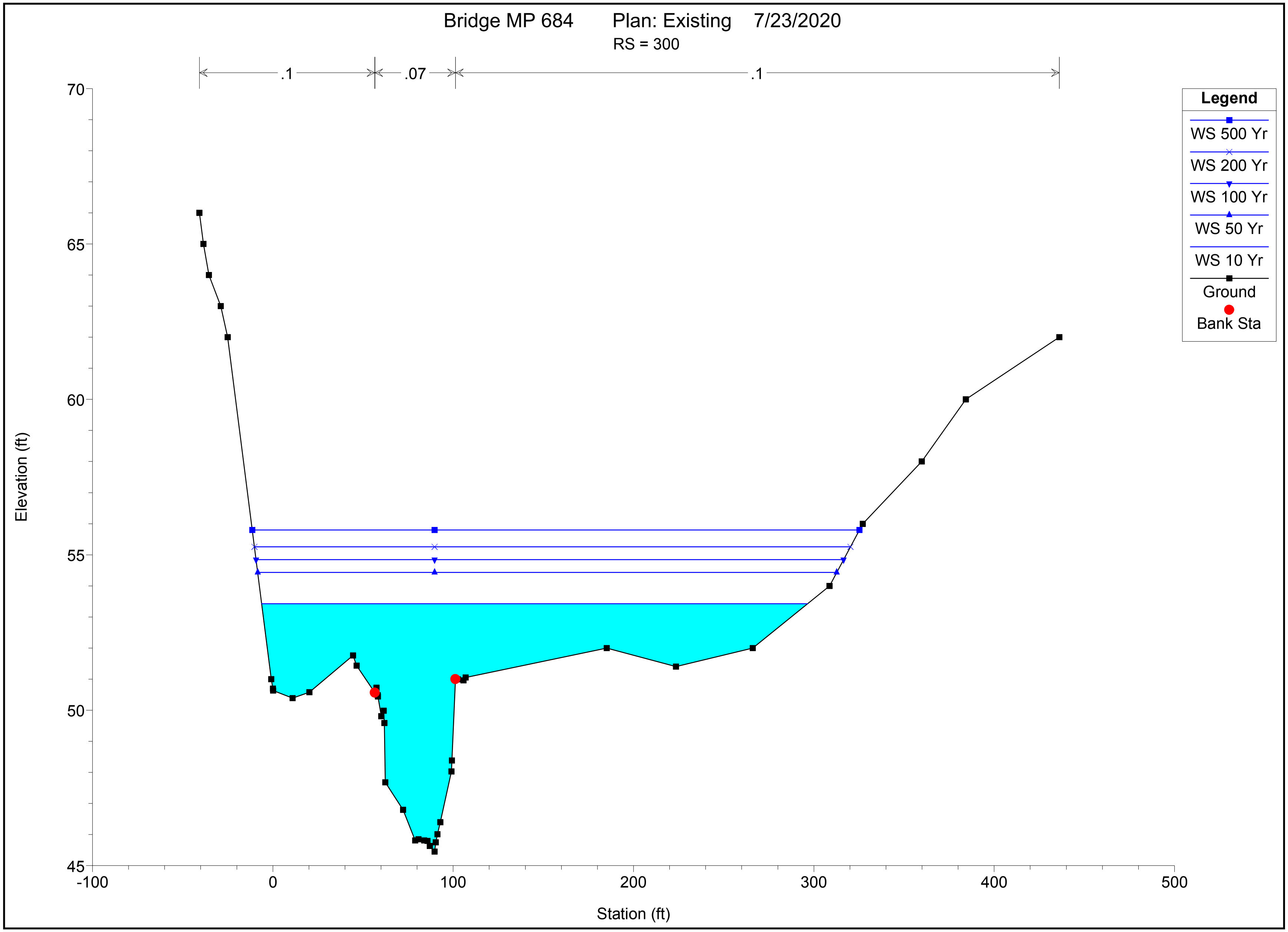
Bridge MP 684 Plan: Existing 7/23/2020

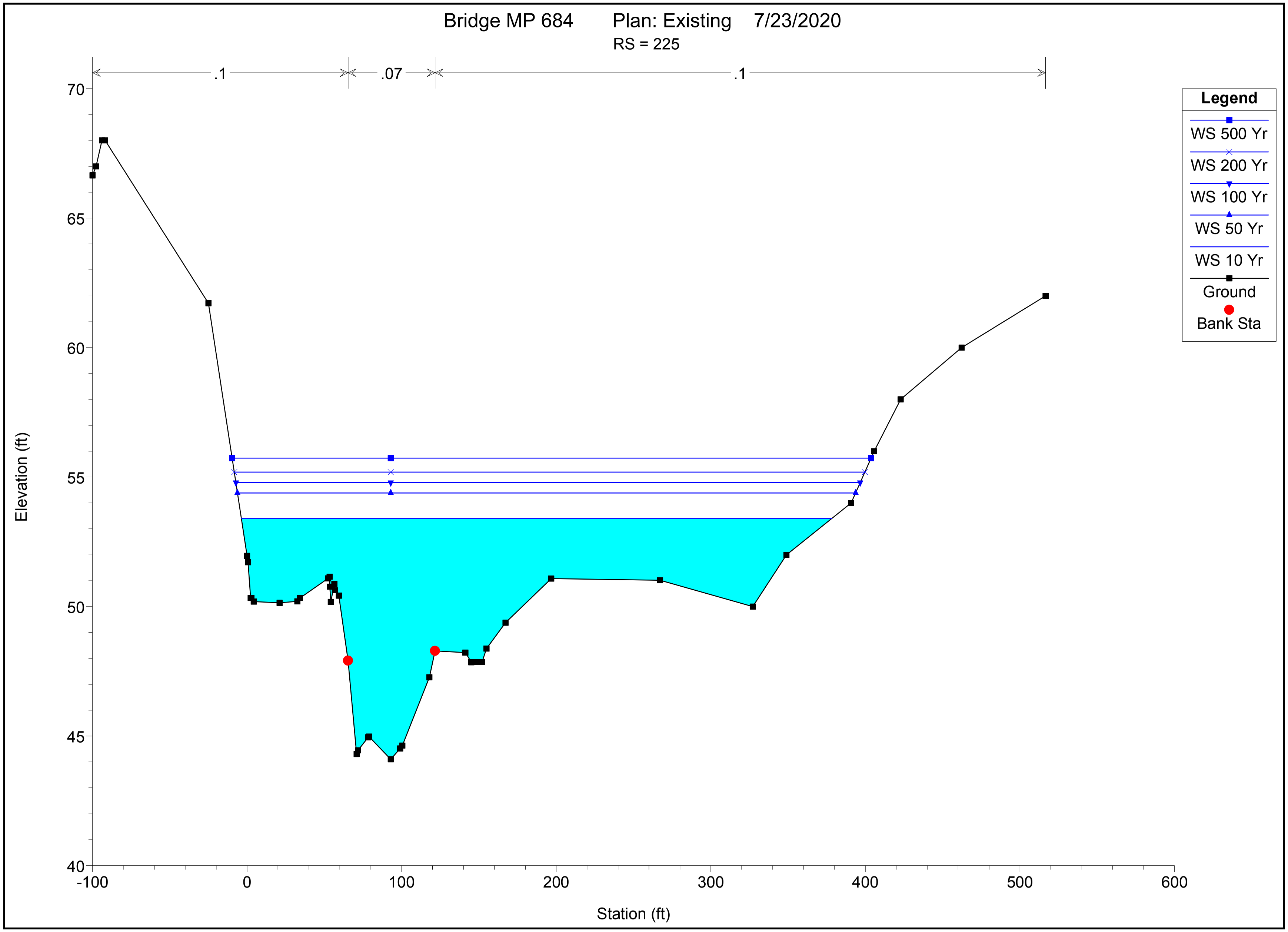
RS = 503 BR Existing Bridge MP 6.84

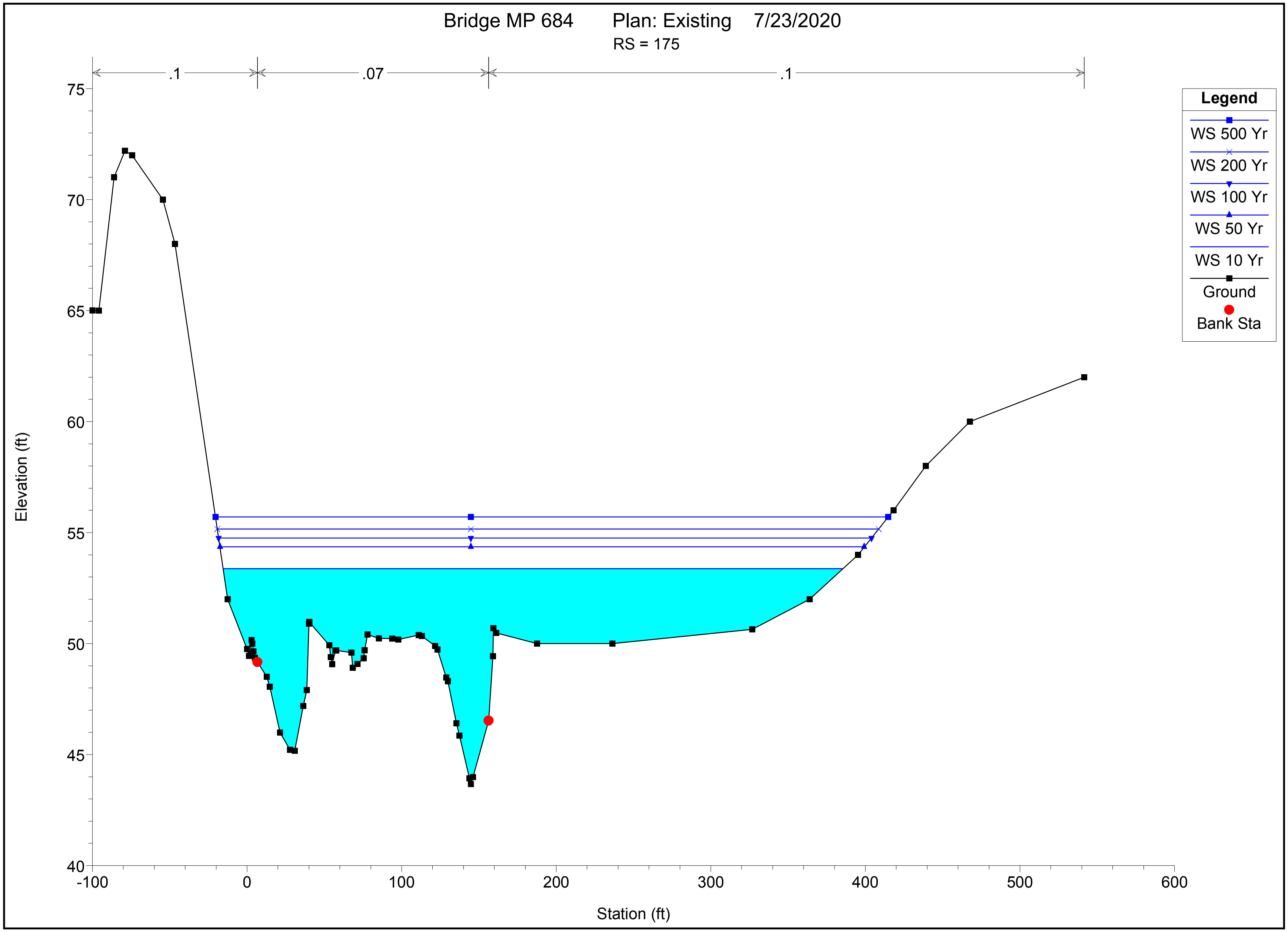

Bridge MP 684
Plan: Existing
7/23/2020
RS = 470
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
65
60
55
50
45
40
35
-100
0
100
200
300
400
500
Station (ft)

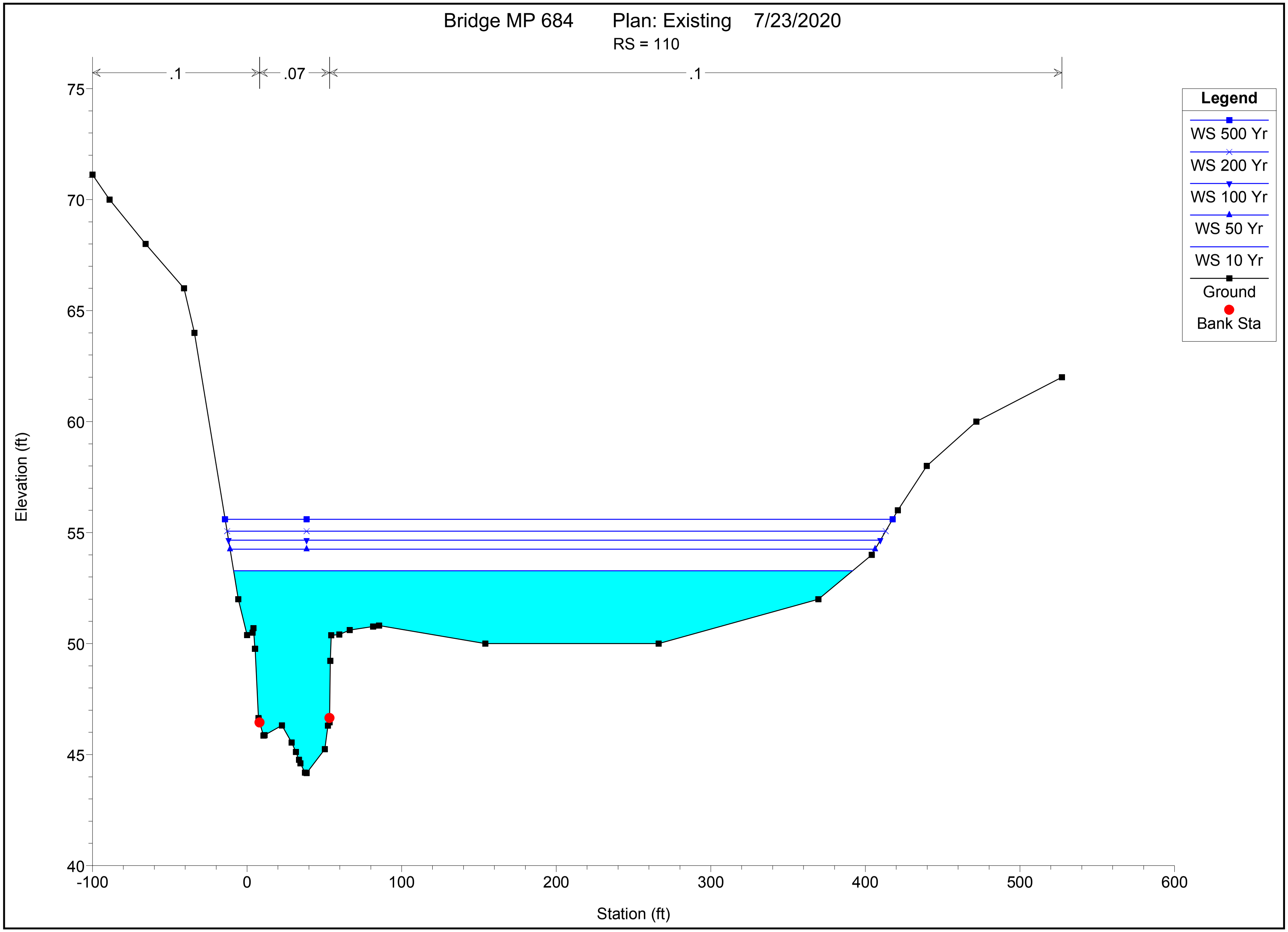

Bridge MP 684 Plan: Existing 7/23/2020
RS = 425
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
65
60
55
50
45
40
35
Station (ft)
-50
0
50
100
150
200
250
300
350


Bridge MP 684 Plan: Existing 7/23/2020
RS = 375
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
70
65
60
55
50
45
Station (ft)
-100
0
100
200
300
400


Bridge MP 684
Plan: Existing
7/23/2020
RS = 300
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
70
65
60
55
50
45
Station (ft)
-100
0
100
200
300
400
500

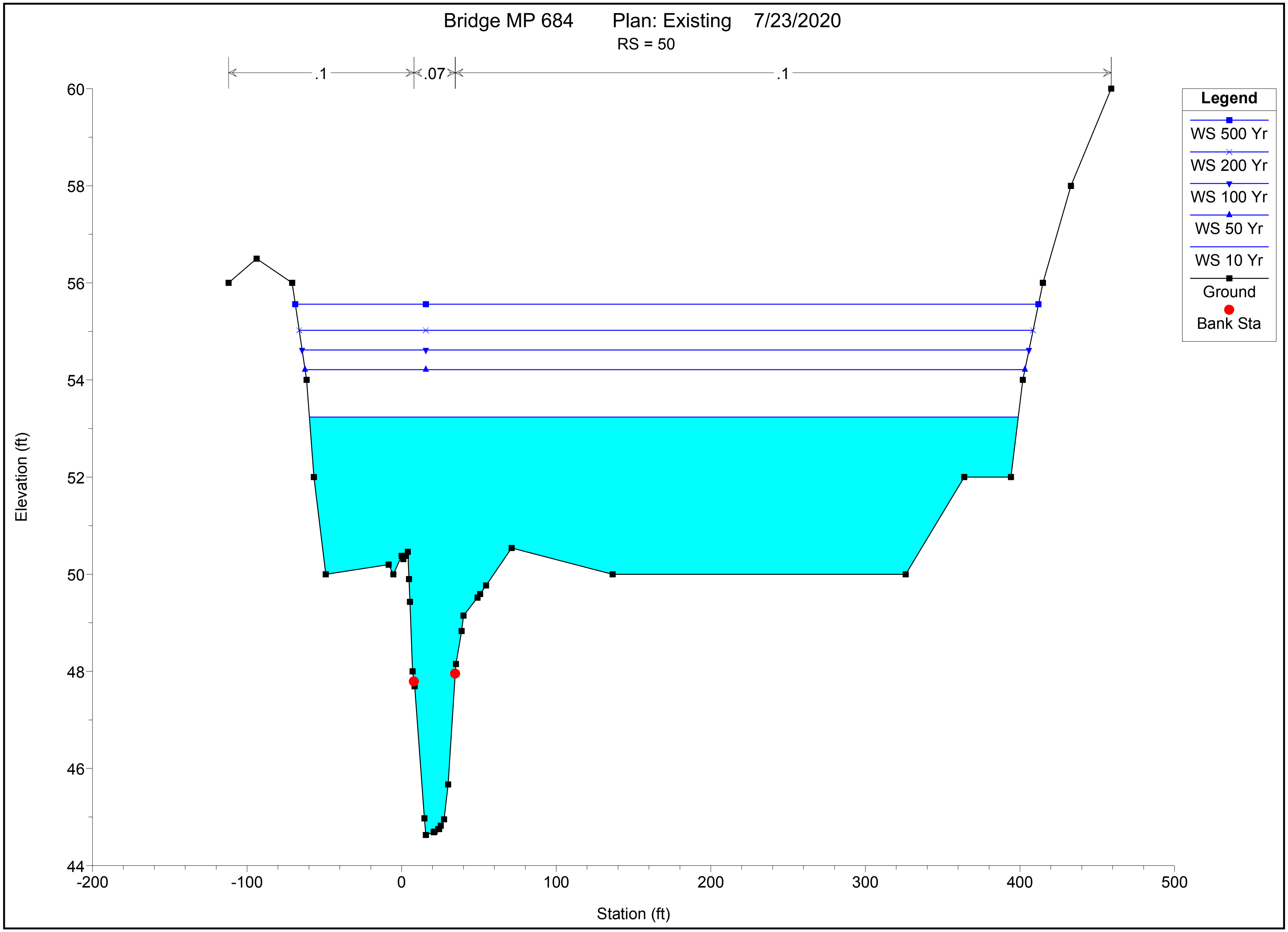

Bridge MP 684 Plan: Existing 7/23/2020
RS = 225
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
70
65
60
55
50
45
40
-100
0
100
200
300
400
500
600
Station (ft)


Bridge MP 684
Plan: Existing
7/23/2020
RS = 175
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
75
70
65
60
55
50
45
40
Station (ft)
-100
0
100
200
300
400
500
600



Bridge MP 684 Plan: Existing 7/23/2020

RS = 110


Bridge MP 684 Plan: Existing 7/23/2020
RS = 50
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
60
58
56
54
52
50
48
46
44
-200
-100
0
100
200
300
400
500
Station (ft)

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 1050 Profile: 10 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 54.71 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.69 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 50.26 | 344.10 | 1652.45 |
| E.G. Slope (ft/ft) | 0.000467 | Area (sq ft) | 50.26 | 344.10 | 1652.45 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 30.37 | 621.18 | 1077.45 |
| Top Width (ft) | 632.60 | Top Width (ft) | 18.62 | 43.26 | 570.71 |
| Vel Total (ft/s) | 0.84 | Avg. Vel. (ft/s) | 0.60 | 1.81 | 0.65 |
| Max Chl Dpth (ft) | 9.31 | Hydr. Depth (ft) | 2.70 | 7.95 | 2.90 |
| Conv. Total (cfs) | 79978.2 | Conv. (cfs) | 1405.0 | 28733.9 | 49839.3 |
| Length Wtd. (ft) | 167.30 | Wetted Per. (ft) | 19.48 | 44.10 | 571.42 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.08 | 0.23 | 0.08 |
| Alpha | 2.02 | Stream Power (lb/ft s) | 0.05 | 0.41 | 0.06 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 4.30 | 11.68 | 28.92 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.40 | 1.76 | 9.10 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 1050 Profile: 50 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 56.20 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.18 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 147.97 | 408.44 | 2503.76 |
| E.G. Slope (ft/ft) | 0.000341 | Area (sq ft) | 147.97 | 408.44 | 2503.76 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 37.02 | 706.16 | 1831.82 |
| Top Width (ft) | 786.43 | Top Width (ft) | 168.99 | 43.26 | 574.18 |
| Vel Total (ft/s) | 0.84 | Avg. Vel. (ft/s) | 0.25 | 1.73 | 0.73 |
| Max Chl Dpth (ft) | 10.80 | Hydr. Depth (ft) | 0.88 | 9.44 | 4.36 |
| Conv. Total (cfs) | 139421.8 | Conv. (cfs) | 2004.6 | 38234.4 | 99182.9 |
| Length Wtd. (ft) | 166.57 | Wetted Per. (ft) | 169.97 | 44.10 | 575.20 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.02 | 0.20 | 0.09 |
| Alpha | 1.70 | Stream Power (lb/ft s) | 0.00 | 0.34 | 0.07 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 6.69 | 13.94 | 41.19 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 2.34 | 1.76 | 9.35 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 1050 Profile: 100 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 56.84 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.83 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 259.24 | 436.54 | 2877.27 |
| E.G. Slope (ft/ft) | 0.000295 | Area (sq ft) | 259.24 | 436.54 | 2877.27 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 86.13 | 733.83 | 2144.04 |
| Top Width (ft) | 792.53 | Top Width (ft) | 173.57 | 43.26 | 575.70 |
| Vel Total (ft/s) | 0.83 | Avg. Vel. (ft/s) | 0.33 | 1.68 | 0.75 |
| Max Chl Dpth (ft) | 11.45 | Hydr. Depth (ft) | 1.49 | 10.09 | 5.00 |
| Conv. Total (cfs) | 172544.2 | Conv. (cfs) | 5013.7 | 42718.9 | 124811.6 |
| Length Wtd. (ft) | 167.54 | Wetted Per. (ft) | 174.59 | 44.10 | 576.85 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.03 | 0.18 | 0.09 |
| Alpha | 1.61 | Stream Power (lb/ft s) | 0.01 | 0.31 | 0.07 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 8.11 | 14.91 | 46.54 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 2.47 | 1.76 | 9.44 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 1050 Profile: 200 Yr

| E.G. Elev (ft) | 57.52 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.50 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 377.81 | 465.69 | 3265.76 |
| E.G. Slope (ft/ft) | 0.000257 | Area (sq ft) | 377.81 | 465.69 | 3265.76 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 147.88 | 762.77 | 2466.35 |
| Top Width (ft) | 798.85 | Top Width (ft) | 178.32 | 43.26 | 577.27 |
| Vel Total (ft/s) | 0.82 | Avg. Vel. (ft/s) | 0.39 | 1.64 | 0.76 |
| Max Chl Dpth (ft) | 12.12 | Hydr. Depth (ft) | 2.12 | 10.76 | 5.66 |
| Conv. Total (cfs) | 210643.7 | Conv. (cfs) | 9224.2 | 47578.8 | 153840.7 |
| Length Wtd. (ft) | 168.54 | Wetted Per. (ft) | 179.39 | 44.10 | 578.56 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.03 | 0.17 | 0.09 |
| Alpha | 1.52 | Stream Power (lb/ft s) | 0.01 | 0.28 | 0.07 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 9.67 | 15.90 | 52.10 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 2.62 | 1.76 | 9.53 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 1050 Profile: 500 Yr

| E.G. Elev (ft) | 58.45 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 58.44 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 548.19 | 506.30 | 3808.65 |
| E.G. Slope (ft/ft) | 0.000216 | Area (sq ft) | 548.19 | 506.30 | 3808.65 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 246.37 | 803.44 | 2912.19 |
| Top Width (ft) | 807.13 | Top Width (ft) | 184.41 | 43.26 | 579.46 |
| Vel Total (ft/s) | 0.81 | Avg. Vel. (ft/s) | 0.45 | 1.59 | 0.76 |
| Max Chl Dpth (ft) | 13.06 | Hydr. Depth (ft) | 2.97 | 11.70 | 6.57 |
| Conv. Total (cfs) | 269704.1 | Conv. (cfs) | 16771.4 | 54692.3 | 198240.4 |
| Length Wtd. (ft) | 169.85 | Wetted Per. (ft) | 185.55 | 44.10 | 580.94 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.04 | 0.15 | 0.09 |
| Alpha | 1.44 | Stream Power (lb/ft s) | 0.02 | 0.25 | 0.07 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 11.98 | 17.26 | 59.83 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 2.81 | 1.76 | 9.74 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 880 Profile: 10 Yr

| E.G. Elev (ft) | 54.66 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.66 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 62.85 | 1010.58 | 1855.91 |
| E.G. Slope (ft/ft) | 0.000167 | Area (sq ft) | 62.85 | 1010.58 | 1855.91 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 24.76 | 834.02 | 870.22 |
| Top Width (ft) | 697.35 | Top Width (ft) | 20.64 | 191.90 | 484.81 |
| Vel Total (ft/s) | 0.59 | Avg. Vel. (ft/s) | 0.39 | 0.83 | 0.47 |
| Max Chl Dpth (ft) | 9.45 | Hydr. Depth (ft) | 3.05 | 5.27 | 3.83 |
| Conv. Total (cfs) | 133763.6 | Conv. (cfs) | 1915.5 | 64523.6 | 67324.4 |
| Length Wtd. (ft) | 154.30 | Wetted Per. (ft) | 21.39 | 193.73 | 486.55 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.03 | 0.05 | 0.04 |
| Alpha | 1.27 | Stream Power (lb/ft s) | 0.01 | 0.04 | 0.02 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 3.92 | 9.04 | 22.40 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.27 | 1.30 | 7.14 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 880    Profile: 50 Yr

| E.G. Elev (ft) | 56.16 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.15 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 112.22 | 1297.03 | 2582.92 |
| E.G. Slope (ft/ft) | 0.000141 | Area (sq ft) | 112.22 | 1297.03 | 2582.92 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 35.32 | 1161.50 | 1378.18 |
| Top Width (ft) | 727.47 | Top Width (ft) | 46.28 | 191.90 | 489.29 |
| Vel Total (ft/s) | 0.65 | Avg. Vel. (ft/s) | 0.31 | 0.90 | 0.53 |
| Max Chl Dpth (ft) | 10.94 | Hydr. Depth (ft) | 2.42 | 6.76 | 5.28 |
| Conv. Total (cfs) | 216823.2 | Conv. (cfs) | 2973.9 | 97802.1 | 116047.2 |
| Length Wtd. (ft) | 155.52 | Wetted Per. (ft) | 47.12 | 193.73 | 491.27 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.02 | 0.06 | 0.05 |
| Alpha | 1.24 | Stream Power (lb/ft s) | 0.01 | 0.05 | 0.02 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 5.81 | 10.62 | 31.75 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.62 | 1.30 | 7.37 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 880    Profile: 100 Yr

| E.G. Elev (ft) | 56.81 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.80 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 144.24 | 1422.05 | 2902.33 |
| E.G. Slope (ft/ft) | 0.000131 | Area (sq ft) | 144.24 | 1422.05 | 2902.33 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 47.93 | 1306.07 | 1610.00 |
| Top Width (ft) | 735.16 | Top Width (ft) | 52.02 | 191.90 | 491.25 |
| Vel Total (ft/s) | 0.66 | Avg. Vel. (ft/s) | 0.33 | 0.92 | 0.55 |
| Max Chl Dpth (ft) | 11.59 | Hydr. Depth (ft) | 2.77 | 7.41 | 5.91 |
| Conv. Total (cfs) | 258742.2 | Conv. (cfs) | 4183.8 | 114013.7 | 140544.7 |
| Length Wtd. (ft) | 155.84 | Wetted Per. (ft) | 52.89 | 193.73 | 493.33 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.02 | 0.06 | 0.05 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.01 | 0.06 | 0.03 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 6.75 | 11.28 | 35.81 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.72 | 1.30 | 7.46 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 880    Profile: 200 Yr

| E.G. Elev (ft) | 57.49 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.48 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 181.39 | 1551.70 | 3234.91 |
| E.G. Slope (ft/ft) | 0.000122 | Area (sq ft) | 181.39 | 1551.70 | 3234.91 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 63.09 | 1457.67 | 1856.24 |
| Top Width (ft) | 743.13 | Top Width (ft) | 57.96 | 191.90 | 493.27 |
| Vel Total (ft/s) | 0.68 | Avg. Vel. (ft/s) | 0.35 | 0.94 | 0.57 |
| Max Chl Dpth (ft) | 12.27 | Hydr. Depth (ft) | 3.13 | 8.09 | 6.56 |
| Conv. Total (cfs) | 305481.9 | Conv. (cfs) | 5707.2 | 131859.9 | 167914.9 |
| Length Wtd. (ft) | 156.09 | Wetted Per. (ft) | 58.87 | 193.73 | 495.47 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.02 | 0.06 | 0.05 |
| Alpha | 1.22 | Stream Power (lb/ft s) | 0.01 | 0.06 | 0.03 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 7.79 | 11.97 | 40.03 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.82 | 1.30 | 7.54 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 880 Profile: 500 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 58.43 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 58.42 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 239.88 | 1732.19 | 3705.14 |
| E.G. Slope (ft/ft) | 0.000113 | Area (sq ft) | 239.88 | 1732.19 | 3705.14 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 88.07 | 1681.62 | 2192.32 |
| Top Width (ft) | 765.83 | Top Width (ft) | 66.59 | 191.90 | 507.34 |
| Vel Total (ft/s) | 0.70 | Avg. Vel. (ft/s) | 0.37 | 0.97 | 0.59 |
| Max Chl Dpth (ft) | 13.21 | Hydr. Depth (ft) | 3.60 | 9.03 | 7.30 |
| Conv. Total (cfs) | 373203.9 | Conv. (cfs) | 8295.8 | 158401.2 | 206507.0 |
| Length Wtd. (ft) | 156.30 | Wetted Per. (ft) | 67.56 | 193.73 | 510.04 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.02 | 0.06 | 0.05 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.01 | 0.06 | 0.03 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 9.33 | 12.90 | 45.88 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.96 | 1.30 | 7.72 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 750 Profile: 10 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 54.63 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.62 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 42.26 | 185.43 | 2160.99 |
| E.G. Slope (ft/ft) | 0.000361 | Area (sq ft) | 42.26 | 185.43 | 2160.99 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 16.00 | 294.44 | 1418.56 |
| Top Width (ft) | 656.34 | Top Width (ft) | 25.31 | 22.72 | 608.31 |
| Vel Total (ft/s) | 0.72 | Avg. Vel. (ft/s) | 0.38 | 1.59 | 0.66 |
| Max Chl Dpth (ft) | 9.68 | Hydr. Depth (ft) | 1.67 | 8.16 | 3.55 |
| Conv. Total (cfs) | 91055.2 | Conv. (cfs) | 842.8 | 15506.4 | 74706.1 |
| Length Wtd. (ft) | 70.84 | Wetted Per. (ft) | 27.17 | 23.71 | 608.96 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.04 | 0.18 | 0.08 |
| Alpha | 1.50 | Stream Power (lb/ft s) | 0.01 | 0.28 | 0.05 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 3.74 | 7.25 | 14.73 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.19 | 0.98 | 5.05 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 750 Profile: 50 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 56.13 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.12 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 121.29 | 219.54 | 3077.65 |
| E.G. Slope (ft/ft) | 0.000268 | Area (sq ft) | 121.29 | 219.54 | 3077.65 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 43.76 | 336.53 | 2194.71 |
| Top Width (ft) | 700.65 | Top Width (ft) | 65.27 | 22.72 | 612.66 |
| Vel Total (ft/s) | 0.75 | Avg. Vel. (ft/s) | 0.36 | 1.53 | 0.71 |
| Max Chl Dpth (ft) | 11.18 | Hydr. Depth (ft) | 1.86 | 9.66 | 5.02 |
| Conv. Total (cfs) | 157224.6 | Conv. (cfs) | 2672.1 | 20547.7 | 134004.8 |
| Length Wtd. (ft) | 71.12 | Wetted Per. (ft) | 67.19 | 23.71 | 613.56 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.03 | 0.16 | 0.08 |
| Alpha | 1.31 | Stream Power (lb/ft s) | 0.01 | 0.24 | 0.06 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 5.41 | 8.35 | 20.93 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.43 | 0.98 | 5.27 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 750    Profile: 100 Yr

| E.G. Elev (ft) | 56.78 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.77 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 167.64 | 234.41 | 3479.42 |
| E.G. Slope (ft/ft) | 0.000241 | Area (sq ft) | 167.64 | 234.41 | 3479.42 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 64.22 | 355.68 | 2544.10 |
| Top Width (ft) | 714.36 | Top Width (ft) | 76.36 | 22.72 | 615.28 |
| Vel Total (ft/s) | 0.76 | Avg. Vel. (ft/s) | 0.38 | 1.52 | 0.73 |
| Max Chl Dpth (ft) | 11.83 | Hydr. Depth (ft) | 2.20 | 10.32 | 5.66 |
| Conv. Total (cfs) | 190989.0 | Conv. (cfs) | 4137.8 | 22918.9 | 163932.4 |
| Length Wtd. (ft) | 71.44 | Wetted Per. (ft) | 78.30 | 23.71 | 616.26 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.03 | 0.15 | 0.08 |
| Alpha | 1.27 | Stream Power (lb/ft s) | 0.01 | 0.23 | 0.06 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 6.22 | 8.81 | 23.63 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.50 | 0.98 | 5.34 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 750    Profile: 200 Yr

| E.G. Elev (ft) | 57.46 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.45 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 223.33 | 249.82 | 3897.62 |
| E.G. Slope (ft/ft) | 0.000217 | Area (sq ft) | 223.33 | 249.82 | 3897.62 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 89.80 | 375.73 | 2911.47 |
| Top Width (ft) | 728.57 | Top Width (ft) | 87.86 | 22.72 | 617.99 |
| Vel Total (ft/s) | 0.77 | Avg. Vel. (ft/s) | 0.40 | 1.50 | 0.75 |
| Max Chl Dpth (ft) | 12.51 | Hydr. Depth (ft) | 2.54 | 11.00 | 6.31 |
| Conv. Total (cfs) | 229048.1 | Conv. (cfs) | 6090.5 | 25484.4 | 197473.2 |
| Length Wtd. (ft) | 71.77 | Wetted Per. (ft) | 89.82 | 23.71 | 619.06 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.03 | 0.14 | 0.09 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.01 | 0.22 | 0.06 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 7.10 | 9.28 | 26.40 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.58 | 0.98 | 5.42 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 750    Profile: 500 Yr

| E.G. Elev (ft) | 58.40 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 58.39 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 313.09 | 271.26 | 4482.21 |
| E.G. Slope (ft/ft) | 0.000190 | Area (sq ft) | 313.09 | 271.26 | 4482.21 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 135.04 | 402.73 | 3424.23 |
| Top Width (ft) | 743.28 | Top Width (ft) | 100.37 | 22.72 | 620.19 |
| Vel Total (ft/s) | 0.78 | Avg. Vel. (ft/s) | 0.43 | 1.48 | 0.76 |
| Max Chl Dpth (ft) | 13.45 | Hydr. Depth (ft) | 3.12 | 11.94 | 7.23 |
| Conv. Total (cfs) | 287588.3 | Conv. (cfs) | 9802.2 | 29232.5 | 248553.6 |
| Length Wtd. (ft) | 72.24 | Wetted Per. (ft) | 102.37 | 23.71 | 621.72 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.04 | 0.14 | 0.09 |
| Alpha | 1.20 | Stream Power (lb/ft s) | 0.02 | 0.20 | 0.07 |
| Frctn Loss (ft) | 0.01 | Cum Volume (acre-ft) | 8.39 | 9.91 | 30.24 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.68 | 0.98 | 5.57 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 680 Profile: 10 Yr

| E.G. Elev (ft) | 54.60 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.58 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 145.08 | 638.70 | 1285.51 |
| E.G. Slope (ft/ft) | 0.000348 | Area (sq ft) | 145.08 | 638.70 | 1415.35 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 77.06 | 887.23 | 764.70 |
| Top Width (ft) | 627.96 | Top Width (ft) | 54.24 | 96.38 | 477.33 |
| Vel Total (ft/s) | 0.84 | Avg. Vel. (ft/s) | 0.53 | 1.39 | 0.59 |
| Max Chl Dpth (ft) | 10.10 | Hydr. Depth (ft) | 2.67 | 6.63 | 3.17 |
| Conv. Total (cfs) | 92669.7 | Conv. (cfs) | 4130.3 | 47553.4 | 40986.0 |
| Length Wtd. (ft) | 89.14 | Wetted Per. (ft) | 54.70 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.06 | 0.14 | 0.07 |
| Alpha | 1.66 | Stream Power (lb/ft s) | 0.03 | 0.20 | 0.04 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 3.46 | 6.59 | 11.91 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.07 | 0.88 | 4.20 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 680 Profile: 50 Yr

| E.G. Elev (ft) | 56.11 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.09 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 250.44 | 783.86 | 1895.79 |
| E.G. Slope (ft/ft) | 0.000285 | Area (sq ft) | 250.44 | 783.86 | 2139.07 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 123.55 | 1129.40 | 1322.06 |
| Top Width (ft) | 670.23 | Top Width (ft) | 90.29 | 96.38 | 483.55 |
| Vel Total (ft/s) | 0.88 | Avg. Vel. (ft/s) | 0.49 | 1.44 | 0.70 |
| Max Chl Dpth (ft) | 11.61 | Hydr. Depth (ft) | 2.77 | 8.13 | 4.68 |
| Conv. Total (cfs) | 152529.6 | Conv. (cfs) | 7318.2 | 66899.7 | 78311.7 |
| Length Wtd. (ft) | 90.19 | Wetted Per. (ft) | 90.81 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.05 | 0.14 | 0.08 |
| Alpha | 1.52 | Stream Power (lb/ft s) | 0.02 | 0.21 | 0.06 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 4.85 | 7.55 | 16.82 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.19 | 0.88 | 4.40 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 680 Profile: 100 Yr

| E.G. Elev (ft) | 56.76 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.75 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 312.44 | 847.10 | 2161.64 |
| E.G. Slope (ft/ft) | 0.000261 | Area (sq ft) | 312.44 | 847.10 | 2457.00 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 161.03 | 1229.34 | 1573.63 |
| Top Width (ft) | 680.63 | Top Width (ft) | 98.69 | 96.38 | 485.56 |
| Vel Total (ft/s) | 0.89 | Avg. Vel. (ft/s) | 0.52 | 1.45 | 0.73 |
| Max Chl Dpth (ft) | 12.27 | Hydr. Depth (ft) | 3.17 | 8.79 | 5.34 |
| Conv. Total (cfs) | 183565.0 | Conv. (cfs) | 9972.9 | 76134.6 | 97457.5 |
| Length Wtd. (ft) | 90.75 | Wetted Per. (ft) | 99.23 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.05 | 0.14 | 0.09 |
| Alpha | 1.47 | Stream Power (lb/ft s) | 0.03 | 0.21 | 0.06 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 5.50 | 7.94 | 18.94 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.23 | 0.88 | 4.48 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 680 Profile: 200 Yr

| E.G. Elev (ft) | 57.44 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.43 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 382.47 | 912.61 | 2437.05 |
| E.G. Slope (ft/ft) | 0.000239 | Area (sq ft) | 382.47 | 912.61 | 2787.74 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 204.20 | 1332.69 | 1840.11 |
| Top Width (ft) | 691.40 | Top Width (ft) | 107.39 | 96.38 | 487.63 |
| Vel Total (ft/s) | 0.90 | Avg. Vel. (ft/s) | 0.53 | 1.46 | 0.76 |
| Max Chl Dpth (ft) | 12.95 | Hydr. Depth (ft) | 3.56 | 9.47 | 6.01 |
| Conv. Total (cfs) | 218425.7 | Conv. (cfs) | 13207.5 | 86198.8 | 119019.3 |
| Length Wtd. (ft) | 91.22 | Wetted Per. (ft) | 107.96 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.05 | 0.14 | 0.09 |
| Alpha | 1.43 | Stream Power (lb/ft s) | 0.03 | 0.20 | 0.07 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 6.19 | 8.35 | 21.13 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.28 | 0.88 | 4.55 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 680 Profile: 500 Yr

| E.G. Elev (ft) | 58.39 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 58.37 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 489.48 | 1003.73 | 2820.10 |
| E.G. Slope (ft/ft) | 0.000213 | Area (sq ft) | 489.48 | 1003.73 | 3249.89 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 272.79 | 1474.04 | 2215.18 |
| Top Width (ft) | 703.93 | Top Width (ft) | 118.17 | 96.38 | 489.38 |
| Vel Total (ft/s) | 0.92 | Avg. Vel. (ft/s) | 0.56 | 1.47 | 0.79 |
| Max Chl Dpth (ft) | 13.89 | Hydr. Depth (ft) | 4.14 | 10.41 | 6.96 |
| Conv. Total (cfs) | 271513.1 | Conv. (cfs) | 18694.0 | 101014.7 | 151804.5 |
| Length Wtd. (ft) | 91.82 | Wetted Per. (ft) | 118.79 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.05 | 0.14 | 0.09 |
| Alpha | 1.39 | Stream Power (lb/ft s) | 0.03 | 0.20 | 0.07 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 7.18 | 8.88 | 24.14 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.35 | 0.88 | 4.69 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 600 Profile: 10 Yr

| E.G. Elev (ft) | 54.56 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.54 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 358.86 | 332.38 | 878.62 |
| E.G. Slope (ft/ft) | 0.000471 | Area (sq ft) | 358.86 | 332.38 | 1541.89 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 281.29 | 638.18 | 809.53 |
| Top Width (ft) | 517.69 | Top Width (ft) | 93.28 | 38.63 | 385.78 |
| Vel Total (ft/s) | 1.10 | Avg. Vel. (ft/s) | 0.78 | 1.92 | 0.92 |
| Max Chl Dpth (ft) | 9.72 | Hydr. Depth (ft) | 3.85 | 8.60 | 4.84 |
| Conv. Total (cfs) | 79670.9 | Conv. (cfs) | 12961.8 | 29406.7 | 37302.4 |
| Length Wtd. (ft) | 72.85 | Wetted Per. (ft) | 94.69 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.11 | 0.25 | 0.14 |
| Alpha | 1.53 | Stream Power (lb/ft s) | 0.09 | 0.48 | 0.13 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 2.52 | 5.70 | 9.15 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.79 | 0.76 | 3.39 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 600    Profile: 50 Yr

| E.G. Elev (ft) | 56.07 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.04 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 503.50 | 390.46 | 1151.31 |
| E.G. Slope (ft/ft) | 0.000470 | Area (sq ft) | 503.50 | 390.46 | 2125.39 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 471.98 | 833.90 | 1269.12 |
| Top Width (ft) | 529.00 | Top Width (ft) | 99.86 | 38.63 | 390.51 |
| Vel Total (ft/s) | 1.26 | Avg. Vel. (ft/s) | 0.94 | 2.14 | 1.10 |
| Max Chl Dpth (ft) | 11.22 | Hydr. Depth (ft) | 5.04 | 10.11 | 6.35 |
| Conv. Total (cfs) | 118757.9 | Conv. (cfs) | 21767.6 | 38459.2 | 58531.0 |
| Length Wtd. (ft) | 73.74 | Wetted Per. (ft) | 101.46 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.15 | 0.29 | 0.19 |
| Alpha | 1.41 | Stream Power (lb/ft s) | 0.14 | 0.63 | 0.20 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 3.45 | 6.47 | 12.84 |
| C & E Loss (ft) | 0.05 | Cum SA (acres) | 0.84 | 0.76 | 3.59 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 600    Profile: 100 Yr

| E.G. Elev (ft) | 56.73 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.69 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 569.93 | 415.77 | 1270.18 |
| E.G. Slope (ft/ft) | 0.000462 | Area (sq ft) | 569.93 | 415.77 | 2381.99 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 563.91 | 917.99 | 1482.10 |
| Top Width (ft) | 534.08 | Top Width (ft) | 102.88 | 38.63 | 392.58 |
| Vel Total (ft/s) | 1.31 | Avg. Vel. (ft/s) | 0.99 | 2.21 | 1.17 |
| Max Chl Dpth (ft) | 11.87 | Hydr. Depth (ft) | 5.54 | 10.76 | 7.00 |
| Conv. Total (cfs) | 137882.6 | Conv. (cfs) | 26232.6 | 42704.3 | 68945.8 |
| Length Wtd. (ft) | 74.05 | Wetted Per. (ft) | 104.54 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.16 | 0.31 | 0.20 |
| Alpha | 1.38 | Stream Power (lb/ft s) | 0.16 | 0.68 | 0.24 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 3.86 | 6.78 | 14.43 |
| C & E Loss (ft) | 0.06 | Cum SA (acres) | 0.86 | 0.76 | 3.66 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 600    Profile: 200 Yr

| E.G. Elev (ft) | 57.41 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.37 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 641.17 | 442.00 | 1393.33 |
| E.G. Slope (ft/ft) | 0.000453 | Area (sq ft) | 641.17 | 442.00 | 2649.25 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 658.66 | 1006.37 | 1711.98 |
| Top Width (ft) | 541.14 | Top Width (ft) | 107.79 | 38.63 | 394.72 |
| Vel Total (ft/s) | 1.36 | Avg. Vel. (ft/s) | 1.03 | 2.28 | 1.23 |
| Max Chl Dpth (ft) | 12.55 | Hydr. Depth (ft) | 5.95 | 11.44 | 7.68 |
| Conv. Total (cfs) | 158681.0 | Conv. (cfs) | 30949.4 | 47287.9 | 80443.7 |
| Length Wtd. (ft) | 74.28 | Wetted Per. (ft) | 109.51 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.17 | 0.32 | 0.22 |
| Alpha | 1.35 | Stream Power (lb/ft s) | 0.17 | 0.73 | 0.27 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 4.28 | 7.10 | 16.06 |
| C & E Loss (ft) | 0.08 | Cum SA (acres) | 0.88 | 0.76 | 3.72 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 600    Profile: 500 Yr

| E.G. Elev (ft) | 58.36 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 58.32 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 747.06 | 478.49 | 1564.69 |
| E.G. Slope (ft/ft) | 0.000436 | Area (sq ft) | 747.06 | 478.49 | 3023.54 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 795.55 | 1127.52 | 2038.92 |
| Top Width (ft) | 552.12 | Top Width (ft) | 115.80 | 38.63 | 397.69 |
| Vel Total (ft/s) | 1.42 | Avg. Vel. (ft/s) | 1.06 | 2.36 | 1.30 |
| Max Chl Dpth (ft) | 13.50 | Hydr. Depth (ft) | 6.45 | 12.39 | 8.63 |
| Conv. Total (cfs) | 189653.8 | Conv. (cfs) | 38081.8 | 53972.4 | 97599.6 |
| Length Wtd. (ft) | 74.57 | Wetted Per. (ft) | 117.57 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.17 | 0.33 | 0.23 |
| Alpha | 1.33 | Stream Power (lb/ft s) | 0.18 | 0.79 | 0.31 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 4.88 | 7.52 | 18.29 |
| C & E Loss (ft) | 0.09 | Cum SA (acres) | 0.91 | 0.76 | 3.86 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 535    Profile: 10 Yr

| E.G. Elev (ft) | 54.47 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.33 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.13 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 48.72 | Flow Area (sq ft) | 73.01 | 273.53 | 62.28 |
| E.G. Slope (ft/ft) | 0.002505 | Area (sq ft) | 437.63 | 273.53 | 1380.45 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 185.10 | 1372.73 | 171.17 |
| Top Width (ft) | 515.67 | Top Width (ft) | 110.02 | 26.15 | 379.50 |
| Vel Total (ft/s) | 4.23 | Avg. Vel. (ft/s) | 2.54 | 5.02 | 2.75 |
| Max Chl Dpth (ft) | 10.96 | Hydr. Depth (ft) | 6.85 | 10.46 | 7.84 |
| Conv. Total (cfs) | 34547.1 | Conv. (cfs) | 3698.6 | 27428.4 | 3420.1 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 11.60 | 26.64 | 8.77 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 0.98 | 1.61 | 1.11 |
| Alpha | 1.20 | Stream Power (lb/ft s) | 2.50 | 8.06 | 3.05 |
| Frctn Loss (ft) | 0.10 | Cum Volume (acre-ft) | 1.34 | 5.25 | 7.06 |
| C & E Loss (ft) | 0.10 | Cum SA (acres) | 0.49 | 0.71 | 2.84 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 535    Profile: 50 Yr

| E.G. Elev (ft) | 55.95 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.57 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.38 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 50.03 | Flow Area (sq ft) | 86.26 | 306.03 | 72.15 |
| E.G. Slope (ft/ft) | 0.003701 | Area (sq ft) | 576.46 | 306.03 | 1854.97 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 297.09 | 2012.03 | 265.87 |
| Top Width (ft) | 523.67 | Top Width (ft) | 113.40 | 26.15 | 384.12 |
| Vel Total (ft/s) | 5.54 | Avg. Vel. (ft/s) | 3.44 | 6.57 | 3.69 |
| Max Chl Dpth (ft) | 12.21 | Hydr. Depth (ft) | 8.09 | 11.70 | 9.09 |
| Conv. Total (cfs) | 42326.1 | Conv. (cfs) | 4883.4 | 33072.4 | 4370.2 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 11.60 | 26.64 | 8.77 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 1.72 | 2.65 | 1.90 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 5.92 | 17.45 | 7.01 |
| Frctn Loss (ft) | 0.14 | Cum Volume (acre-ft) | 1.85 | 5.95 | 10.00 |
| C & E Loss (ft) | 0.17 | Cum SA (acres) | 0.52 | 0.71 | 3.03 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 535 Profile: 100 Yr

| E.G. Elev (ft) | 56.59 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.68 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.91 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 50.54 | Flow Area (sq ft) | 91.96 | 320.00 | 76.39 |
| E.G. Slope (ft/ft) | 0.004176 | Area (sq ft) | 637.44 | 320.00 | 2060.74 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 351.06 | 2302.31 | 310.63 |
| Top Width (ft) | 527.11 | Top Width (ft) | 114.85 | 26.15 | 386.11 |
| Vel Total (ft/s) | 6.07 | Avg. Vel. (ft/s) | 3.82 | 7.19 | 4.07 |
| Max Chl Dpth (ft) | 12.74 | Hydr. Depth (ft) | 8.63 | 12.24 | 9.62 |
| Conv. Total (cfs) | 45866.5 | Conv. (cfs) | 5432.6 | 35627.1 | 4806.8 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 11.60 | 26.64 | 8.77 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 2.07 | 3.13 | 2.27 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 7.89 | 22.53 | 9.24 |
| Frctn Loss (ft) | 0.16 | Cum Volume (acre-ft) | 2.07 | 6.24 | 11.25 |
| C & E Loss (ft) | 0.22 | Cum SA (acres) | 0.54 | 0.71 | 3.10 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 535 Profile: 200 Yr

| E.G. Elev (ft) | 57.26 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.80 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.46 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 51.06 | Flow Area (sq ft) | 97.83 | 334.41 | 80.77 |
| E.G. Slope (ft/ft) | 0.004628 | Area (sq ft) | 701.16 | 334.41 | 2274.15 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 409.77 | 2608.40 | 358.83 |
| Top Width (ft) | 530.65 | Top Width (ft) | 116.35 | 26.15 | 388.16 |
| Vel Total (ft/s) | 6.58 | Avg. Vel. (ft/s) | 4.19 | 7.80 | 4.44 |
| Max Chl Dpth (ft) | 13.29 | Hydr. Depth (ft) | 9.18 | 12.79 | 10.17 |
| Conv. Total (cfs) | 49639.9 | Conv. (cfs) | 6023.4 | 38342.0 | 5274.6 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 11.60 | 26.64 | 8.77 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 2.44 | 3.63 | 2.66 |
| Alpha | 1.18 | Stream Power (lb/ft s) | 10.21 | 28.29 | 11.83 |
| Frctn Loss (ft) | 0.18 | Cum Volume (acre-ft) | 2.29 | 6.52 | 12.54 |
| C & E Loss (ft) | 0.27 | Cum SA (acres) | 0.55 | 0.71 | 3.16 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 535 Profile: 500 Yr

| E.G. Elev (ft) | 58.19 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.96 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.23 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 51.73 | Flow Area (sq ft) | 106.02 | 354.50 | 86.87 |
| E.G. Slope (ft/ft) | 0.005170 | Area (sq ft) | 791.35 | 354.50 | 2573.46 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 495.22 | 3038.57 | 428.21 |
| Top Width (ft) | 535.60 | Top Width (ft) | 118.44 | 26.15 | 391.01 |
| Vel Total (ft/s) | 7.24 | Avg. Vel. (ft/s) | 4.67 | 8.57 | 4.93 |
| Max Chl Dpth (ft) | 14.06 | Hydr. Depth (ft) | 9.95 | 13.56 | 10.94 |
| Conv. Total (cfs) | 55099.7 | Conv. (cfs) | 6887.0 | 42257.5 | 5955.1 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 11.60 | 26.64 | 8.77 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 2.95 | 4.30 | 3.20 |
| Alpha | 1.18 | Stream Power (lb/ft s) | 13.78 | 36.82 | 15.77 |
| Frctn Loss (ft) | 0.21 | Cum Volume (acre-ft) | 2.60 | 6.90 | 14.29 |
| C & E Loss (ft) | 0.35 | Cum SA (acres) | 0.57 | 0.71 | 3.30 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 BR U Profile: 10 Yr

| E.G. Elev (ft) | 54.28 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.65 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.62 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 50.37 | Flow Area (sq ft) | 51.32 | 220.12 | 24.50 |
| E.G. Slope (ft/ft) | 0.006486 | Area (sq ft) | 51.46 | 220.12 | 24.50 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 167.12 | 1505.82 | 56.06 |
| Top Width (ft) | 42.99 | Top Width (ft) | 10.71 | 26.15 | 6.13 |
| Vel Total (ft/s) | 5.84 | Avg. Vel. (ft/s) | 3.26 | 6.84 | 2.29 |
| Max Chl Dpth (ft) | 10.43 | Hydr. Depth (ft) | 4.81 | 8.42 | 4.00 |
| Conv. Total (cfs) | 21468.6 | Conv. (cfs) | 2075.0 | 18697.4 | 696.1 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 11.44 | 27.50 | 9.26 |
| Min Ch El (ft) | 43.20 | Shear (lb/sq ft) | 1.82 | 3.24 | 1.07 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 5.92 | 22.17 | 2.45 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 1.20 | 5.11 | 6.66 |
| C & E Loss (ft) | 0.09 | Cum SA (acres) | 0.46 | 0.70 | 2.73 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 BR U Profile: 50 Yr

| E.G. Elev (ft) | 55.63 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 1.15 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.48 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 51.84 | Flow Area (sq ft) | 60.46 | 242.53 | 29.75 |
| E.G. Slope (ft/ft) | 0.010110 | Area (sq ft) | 60.63 | 242.53 | 29.75 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 274.13 | 2209.65 | 91.21 |
| Top Width (ft) | 42.99 | Top Width (ft) | 10.71 | 26.15 | 6.13 |
| Vel Total (ft/s) | 7.74 | Avg. Vel. (ft/s) | 4.53 | 9.11 | 3.07 |
| Max Chl Dpth (ft) | 11.28 | Hydr. Depth (ft) | 5.67 | 9.27 | 4.85 |
| Conv. Total (cfs) | 25609.9 | Conv. (cfs) | 2726.4 | 21976.3 | 907.2 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 11.44 | 27.50 | 10.12 |
| Min Ch El (ft) | 43.20 | Shear (lb/sq ft) | 3.34 | 5.57 | 1.86 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 15.13 | 50.72 | 5.69 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.67 | 5.79 | 9.46 |
| C & E Loss (ft) | 0.15 | Cum SA (acres) | 0.49 | 0.70 | 2.92 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 BR U Profile: 100 Yr

| E.G. Elev (ft) | 56.21 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 1.40 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.81 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 52.36 | Flow Area (sq ft) | 63.97 | 251.14 | 31.77 |
| E.G. Slope (ft/ft) | 0.011806 | Area (sq ft) | 64.16 | 251.14 | 31.77 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 325.47 | 2530.88 | 107.65 |
| Top Width (ft) | 42.99 | Top Width (ft) | 10.71 | 26.15 | 6.13 |
| Vel Total (ft/s) | 8.54 | Avg. Vel. (ft/s) | 5.09 | 10.08 | 3.39 |
| Max Chl Dpth (ft) | 11.61 | Hydr. Depth (ft) | 6.00 | 9.60 | 5.18 |
| Conv. Total (cfs) | 27278.5 | Conv. (cfs) | 2995.4 | 23292.4 | 990.7 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 11.44 | 27.50 | 10.45 |
| Min Ch El (ft) | 43.20 | Shear (lb/sq ft) | 4.12 | 6.73 | 2.24 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 20.98 | 67.84 | 7.59 |
| Frctn Loss (ft) | 0.15 | Cum Volume (acre-ft) | 1.87 | 6.07 | 10.65 |
| C & E Loss (ft) | 0.18 | Cum SA (acres) | 0.50 | 0.70 | 2.99 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 503     BR U    Profile: 200 Yr

| E.G. Elev (ft) | 56.81 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 1.68 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.13 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 52.89 | Flow Area (sq ft) | 67.32 | 259.36 | 33.70 |
| E.G. Slope (ft/ft) | 0.013646 | Area (sq ft) | 67.53 | 259.36 | 33.70 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 380.97 | 2870.87 | 125.16 |
| Top Width (ft) | 42.99 | Top Width (ft) | 10.71 | 26.15 | 6.13 |
| Vel Total (ft/s) | 9.37 | Avg. Vel. (ft/s) | 5.66 | 11.07 | 3.71 |
| Max Chl Dpth (ft) | 11.93 | Hydr. Depth (ft) | 6.32 | 9.92 | 5.50 |
| Conv. Total (cfs) | 28908.9 | Conv. (cfs) | 3261.3 | 24576.2 | 1071.4 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 11.44 | 27.50 | 10.76 |
| Min Ch El (ft) | 43.20 | Shear (lb/sq ft) | 5.02 | 8.03 | 2.67 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 28.38 | 88.94 | 9.91 |
| Frctn Loss (ft) | 0.17 | Cum Volume (acre-ft) | 2.07 | 6.35 | 11.88 |
| C & E Loss (ft) | 0.21 | Cum SA (acres) | 0.51 | 0.70 | 3.05 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 503     BR U    Profile: 500 Yr

| E.G. Elev (ft) | 57.63 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 2.12 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.51 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 53.59 | Flow Area (sq ft) | 71.44 | 269.46 | 36.06 |
| E.G. Slope (ft/ft) | 0.016371 | Area (sq ft) | 71.66 | 269.46 | 36.06 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 460.70 | 3351.35 | 149.96 |
| Top Width (ft) | 42.99 | Top Width (ft) | 10.71 | 26.15 | 6.13 |
| Vel Total (ft/s) | 10.51 | Avg. Vel. (ft/s) | 6.45 | 12.44 | 4.16 |
| Max Chl Dpth (ft) | 12.31 | Hydr. Depth (ft) | 6.70 | 10.30 | 5.88 |
| Conv. Total (cfs) | 30965.0 | Conv. (cfs) | 3600.6 | 26192.4 | 1172.0 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 11.44 | 27.50 | 11.15 |
| Min Ch El (ft) | 43.20 | Shear (lb/sq ft) | 6.38 | 10.02 | 3.31 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 41.18 | 124.56 | 13.74 |
| Frctn Loss (ft) | 0.21 | Cum Volume (acre-ft) | 2.35 | 6.72 | 13.54 |
| C & E Loss (ft) | 0.27 | Cum SA (acres) | 0.53 | 0.70 | 3.18 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 503     BR D    Profile: 10 Yr

| E.G. Elev (ft) | 54.11 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.48 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.63 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 49.66 | Flow Area (sq ft) |  | 304.00 | 13.86 |
| E.G. Slope (ft/ft) | 0.005348 | Area (sq ft) |  | 304.00 | 14.45 |
| Q Total (cfs) | 1729.00 | Flow (cfs) |  | 1699.63 | 29.37 |
| Top Width (ft) | 42.99 | Top Width (ft) |  | 38.68 | 4.31 |
| Vel Total (ft/s) | 5.44 | Avg. Vel. (ft/s) |  | 5.59 | 2.12 |
| Max Chl Dpth (ft) | 11.25 | Hydr. Depth (ft) |  | 7.86 | 3.48 |
| Conv. Total (cfs) | 23642.0 | Conv. (cfs) |  | 23240.4 | 401.6 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 44.48 | 5.09 |
| Min Ch El (ft) | 42.38 | Shear (lb/sq ft) |  | 2.28 | 0.91 |
| Alpha | 1.04 | Stream Power (lb/ft s) |  | 12.76 | 1.93 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.19 | 5.03 | 6.65 |
| C & E Loss (ft) | 0.19 | Cum SA (acres) | 0.46 | 0.69 | 2.73 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 503     BR D     Profile: 50 Yr

| E.G. Elev (ft) | 55.35 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.85 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.50 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 50.96 | Flow Area (sq ft) |  | 337.71 | 17.33 |
| E.G. Slope (ft/ft) | 0.008507 | Area (sq ft) |  | 337.71 | 18.20 |
| Q Total (cfs) | 2575.00 | Flow (cfs) |  | 2521.26 | 53.74 |
| Top Width (ft) | 42.99 | Top Width (ft) |  | 38.68 | 4.31 |
| Vel Total (ft/s) | 7.25 | Avg. Vel. (ft/s) |  | 7.47 | 3.10 |
| Max Chl Dpth (ft) | 12.12 | Hydr. Depth (ft) |  | 8.73 | 4.35 |
| Conv. Total (cfs) | 27918.6 | Conv. (cfs) |  | 27335.9 | 582.7 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 45.35 | 5.09 |
| Min Ch El (ft) | 42.38 | Shear (lb/sq ft) |  | 3.95 | 1.81 |
| Alpha | 1.04 | Stream Power (lb/ft s) |  | 29.52 | 5.60 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 1.66 | 5.70 | 9.45 |
| C & E Loss (ft) | 0.34 | Cum SA (acres) | 0.49 | 0.69 | 2.92 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 503     BR D     Profile: 100 Yr

| E.G. Elev (ft) | 55.88 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 1.04 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.84 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 51.47 | Flow Area (sq ft) |  | 350.80 | 18.68 |
| E.G. Slope (ft/ft) | 0.009999 | Area (sq ft) |  | 350.80 | 19.66 |
| Q Total (cfs) | 2964.00 | Flow (cfs) |  | 2897.99 | 66.01 |
| Top Width (ft) | 42.99 | Top Width (ft) |  | 38.68 | 4.31 |
| Vel Total (ft/s) | 8.02 | Avg. Vel. (ft/s) |  | 8.26 | 3.53 |
| Max Chl Dpth (ft) | 12.46 | Hydr. Depth (ft) |  | 9.07 | 4.69 |
| Conv. Total (cfs) | 29641.2 | Conv. (cfs) |  | 28981.1 | 660.1 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 45.69 | 5.09 |
| Min Ch El (ft) | 42.38 | Shear (lb/sq ft) |  | 4.79 | 2.29 |
| Alpha | 1.04 | Stream Power (lb/ft s) |  | 39.59 | 8.09 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 1.86 | 5.98 | 10.64 |
| C & E Loss (ft) | 0.41 | Cum SA (acres) | 0.50 | 0.69 | 2.99 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 503     BR D     Profile: 200 Yr

| E.G. Elev (ft) | 56.42 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 1.26 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.17 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 52.01 | Flow Area (sq ft) |  | 363.40 | 19.98 |
| E.G. Slope (ft/ft) | 0.011619 | Area (sq ft) |  | 363.40 | 21.06 |
| Q Total (cfs) | 3377.00 | Flow (cfs) |  | 3297.43 | 79.57 |
| Top Width (ft) | 42.99 | Top Width (ft) |  | 38.68 | 4.31 |
| Vel Total (ft/s) | 8.81 | Avg. Vel. (ft/s) |  | 9.07 | 3.98 |
| Max Chl Dpth (ft) | 12.79 | Hydr. Depth (ft) |  | 9.40 | 5.02 |
| Conv. Total (cfs) | 31329.4 | Conv. (cfs) |  | 30591.2 | 738.2 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 46.02 | 5.09 |
| Min Ch El (ft) | 42.38 | Shear (lb/sq ft) |  | 5.73 | 2.85 |
| Alpha | 1.04 | Stream Power (lb/ft s) |  | 51.98 | 11.33 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 2.06 | 6.25 | 11.87 |
| C & E Loss (ft) | 0.49 | Cum SA (acres) | 0.51 | 0.69 | 3.05 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 503     BR D    Profile: 500 Yr

| E.G. Elev (ft) | 57.15 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 1.58 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.57 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 52.69 | Flow Area (sq ft) |  | 379.10 | 21.59 |
| E.G. Slope (ft/ft) | 0.014009 | Area (sq ft) |  | 379.10 | 22.81 |
| Q Total (cfs) | 3962.00 | Flow (cfs) |  | 3862.53 | 99.47 |
| Top Width (ft) | 42.99 | Top Width (ft) |  | 38.68 | 4.31 |
| Vel Total (ft/s) | 9.89 | Avg. Vel. (ft/s) |  | 10.19 | 4.61 |
| Max Chl Dpth (ft) | 13.19 | Hydr. Depth (ft) |  | 9.80 | 5.43 |
| Conv. Total (cfs) | 33474.8 | Conv. (cfs) |  | 32634.4 | 840.4 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 46.42 | 5.09 |
| Min Ch El (ft) | 42.38 | Shear (lb/sq ft) |  | 7.14 | 3.71 |
| Alpha | 1.04 | Stream Power (lb/ft s) |  | 72.77 | 17.08 |
| Frctn Loss (ft) | 0.09 | Cum Volume (acre-ft) | 2.34 | 6.62 | 13.53 |
| C & E Loss (ft) | 0.62 | Cum SA (acres) | 0.53 | 0.69 | 3.18 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 470    Profile: 10 Yr

| E.G. Elev (ft) | 53.89 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.09 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.79 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 75.00 | 650.46 | 20.31 |
| E.G. Slope (ft/ft) | 0.000499 | Area (sq ft) | 91.21 | 650.46 | 676.64 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 76.32 | 1635.80 | 16.88 |
| Top Width (ft) | 367.67 | Top Width (ft) | 37.66 | 50.76 | 279.25 |
| Vel Total (ft/s) | 2.32 | Avg. Vel. (ft/s) | 1.02 | 2.51 | 0.83 |
| Max Chl Dpth (ft) | 14.47 | Hydr. Depth (ft) | 6.80 | 12.81 | 5.10 |
| Conv. Total (cfs) | 77399.9 | Conv. (cfs) | 3416.7 | 73227.6 | 755.5 |
| Length Wtd. (ft) | 45.01 | Wetted Per. (ft) | 13.97 | 53.26 | 5.13 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.17 | 0.38 | 0.12 |
| Alpha | 1.12 | Stream Power (lb/ft s) | 0.17 | 0.96 | 0.10 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 1.16 | 4.74 | 6.45 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.44 | 0.66 | 2.65 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 470    Profile: 50 Yr

| E.G. Elev (ft) | 54.96 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.18 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.79 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 85.98 | 700.99 | 24.27 |
| E.G. Slope (ft/ft) | 0.000851 | Area (sq ft) | 132.33 | 700.99 | 956.84 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 125.18 | 2420.16 | 29.67 |
| Top Width (ft) | 379.36 | Top Width (ft) | 44.96 | 50.76 | 283.64 |
| Vel Total (ft/s) | 3.17 | Avg. Vel. (ft/s) | 1.46 | 3.45 | 1.22 |
| Max Chl Dpth (ft) | 15.47 | Hydr. Depth (ft) | 7.80 | 13.81 | 6.10 |
| Conv. Total (cfs) | 88260.5 | Conv. (cfs) | 4290.5 | 82953.1 | 1016.9 |
| Length Wtd. (ft) | 45.14 | Wetted Per. (ft) | 13.97 | 53.26 | 5.13 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.33 | 0.70 | 0.25 |
| Alpha | 1.12 | Stream Power (lb/ft s) | 0.48 | 2.41 | 0.31 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.62 | 5.39 | 9.15 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 0.47 | 0.66 | 2.83 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 470 Profile: 100 Yr

| E.G. Elev (ft) | 55.41 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.22 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.19 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 90.42 | 721.40 | 25.87 |
| E.G. Slope (ft/ft) | 0.001020 | Area (sq ft) | 151.01 | 721.40 | 1071.27 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 149.00 | 2778.88 | 36.12 |
| Top Width (ft) | 384.08 | Top Width (ft) | 47.90 | 50.76 | 285.41 |
| Vel Total (ft/s) | 3.54 | Avg. Vel. (ft/s) | 1.65 | 3.85 | 1.40 |
| Max Chl Dpth (ft) | 15.87 | Hydr. Depth (ft) | 8.20 | 14.21 | 6.50 |
| Conv. Total (cfs) | 92814.9 | Conv. (cfs) | 4665.7 | 87018.1 | 1131.1 |
| Length Wtd. (ft) | 45.19 | Wetted Per. (ft) | 13.97 | 53.26 | 5.13 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.41 | 0.86 | 0.32 |
| Alpha | 1.12 | Stream Power (lb/ft s) | 0.68 | 3.32 | 0.45 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.81 | 5.65 | 10.31 |
| C & E Loss (ft) | 0.05 | Cum SA (acres) | 0.48 | 0.66 | 2.90 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 470 Profile: 200 Yr

| E.G. Elev (ft) | 55.85 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.27 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.59 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 94.81 | 741.59 | 27.46 |
| E.G. Slope (ft/ft) | 0.001202 | Area (sq ft) | 170.63 | 741.59 | 1185.11 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 175.04 | 3158.68 | 43.29 |
| Top Width (ft) | 388.73 | Top Width (ft) | 50.80 | 50.76 | 287.17 |
| Vel Total (ft/s) | 3.91 | Avg. Vel. (ft/s) | 1.85 | 4.26 | 1.58 |
| Max Chl Dpth (ft) | 16.27 | Hydr. Depth (ft) | 8.60 | 14.61 | 6.90 |
| Conv. Total (cfs) | 97411.4 | Conv. (cfs) | 5049.0 | 91113.7 | 1248.7 |
| Length Wtd. (ft) | 45.25 | Wetted Per. (ft) | 13.97 | 53.26 | 5.13 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.51 | 1.04 | 0.40 |
| Alpha | 1.12 | Stream Power (lb/ft s) | 0.94 | 4.45 | 0.63 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 2.01 | 5.92 | 11.50 |
| C & E Loss (ft) | 0.06 | Cum SA (acres) | 0.50 | 0.66 | 2.96 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 470 Profile: 500 Yr

| E.G. Elev (ft) | 56.44 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.34 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.10 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 100.50 | 767.81 | 29.51 |
| E.G. Slope (ft/ft) | 0.001465 | Area (sq ft) | 197.84 | 767.81 | 1334.02 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 212.98 | 3695.12 | 53.90 |
| Top Width (ft) | 394.77 | Top Width (ft) | 54.56 | 50.76 | 289.44 |
| Vel Total (ft/s) | 4.41 | Avg. Vel. (ft/s) | 2.12 | 4.81 | 1.83 |
| Max Chl Dpth (ft) | 16.78 | Hydr. Depth (ft) | 9.11 | 15.13 | 7.41 |
| Conv. Total (cfs) | 103518.3 | Conv. (cfs) | 5564.7 | 96545.2 | 1408.4 |
| Length Wtd. (ft) | 45.32 | Wetted Per. (ft) | 13.97 | 53.26 | 5.13 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.66 | 1.32 | 0.53 |
| Alpha | 1.12 | Stream Power (lb/ft s) | 1.39 | 6.35 | 0.96 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 2.28 | 6.27 | 13.12 |
| C & E Loss (ft) | 0.08 | Cum SA (acres) | 0.51 | 0.66 | 3.09 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 425    Profile: 10 Yr

| E.G. Elev (ft) | 53.85 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.80 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 9.66 | 903.50 | 65.30 |
| E.G. Slope (ft/ft) | 0.000299 | Area (sq ft) | 72.13 | 903.50 | 94.04 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 5.46 | 1702.86 | 20.68 |
| Top Width (ft) | 175.42 | Top Width (ft) | 35.18 | 73.10 | 67.14 |
| Vel Total (ft/s) | 1.77 | Avg. Vel. (ft/s) | 0.56 | 1.88 | 0.32 |
| Max Chl Dpth (ft) | 16.24 | Hydr. Depth (ft) | 4.04 | 12.36 | 1.44 |
| Conv. Total (cfs) | 99986.9 | Conv. (cfs) | 315.5 | 98475.3 | 1196.1 |
| Length Wtd. (ft) | 50.55 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.06 | 0.22 | 0.03 |
| Alpha | 1.12 | Stream Power (lb/ft s) | 0.03 | 0.41 | 0.01 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.10 | 3.93 | 5.86 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.41 | 0.59 | 2.38 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 425    Profile: 50 Yr

| E.G. Elev (ft) | 54.90 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.10 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.80 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 12.06 | 976.79 | 110.92 |
| E.G. Slope (ft/ft) | 0.000497 | Area (sq ft) | 109.26 | 976.79 | 165.45 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 10.18 | 2500.34 | 64.49 |
| Top Width (ft) | 187.93 | Top Width (ft) | 38.88 | 73.10 | 75.95 |
| Vel Total (ft/s) | 2.34 | Avg. Vel. (ft/s) | 0.84 | 2.56 | 0.58 |
| Max Chl Dpth (ft) | 17.24 | Hydr. Depth (ft) | 5.05 | 13.36 | 2.44 |
| Conv. Total (cfs) | 115494.4 | Conv. (cfs) | 456.4 | 112145.6 | 2892.3 |
| Length Wtd. (ft) | 50.82 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.13 | 0.39 | 0.07 |
| Alpha | 1.16 | Stream Power (lb/ft s) | 0.11 | 1.00 | 0.04 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 1.52 | 4.52 | 8.31 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.44 | 0.59 | 2.56 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 425    Profile: 100 Yr

| E.G. Elev (ft) | 55.33 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.12 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.20 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 13.03 | 1006.52 | 129.42 |
| E.G. Slope (ft/ft) | 0.000589 | Area (sq ft) | 125.37 | 1006.52 | 197.14 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 12.60 | 2860.63 | 90.77 |
| Top Width (ft) | 193.33 | Top Width (ft) | 40.38 | 73.10 | 79.86 |
| Vel Total (ft/s) | 2.58 | Avg. Vel. (ft/s) | 0.97 | 2.84 | 0.70 |
| Max Chl Dpth (ft) | 17.64 | Hydr. Depth (ft) | 5.45 | 13.77 | 2.84 |
| Conv. Total (cfs) | 122153.0 | Conv. (cfs) | 519.4 | 117893.0 | 3740.7 |
| Length Wtd. (ft) | 50.93 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.16 | 0.48 | 0.10 |
| Alpha | 1.17 | Stream Power (lb/ft s) | 0.16 | 1.35 | 0.07 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 1.70 | 4.76 | 9.36 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.45 | 0.59 | 2.62 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 425 Profile: 200 Yr

| E.G. Elev (ft) | 55.75 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.15 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.61 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 14.00 | 1036.02 | 147.78 |
| E.G. Slope (ft/ft) | 0.000686 | Area (sq ft) | 141.97 | 1036.02 | 230.14 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 15.32 | 3239.49 | 122.19 |
| Top Width (ft) | 198.69 | Top Width (ft) | 41.86 | 73.10 | 83.73 |
| Vel Total (ft/s) | 2.82 | Avg. Vel. (ft/s) | 1.09 | 3.13 | 0.83 |
| Max Chl Dpth (ft) | 18.05 | Hydr. Depth (ft) | 5.86 | 14.17 | 3.25 |
| Conv. Total (cfs) | 128957.9 | Conv. (cfs) | 585.0 | 123706.7 | 4666.2 |
| Length Wtd. (ft) | 51.07 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.20 | 0.57 | 0.13 |
| Alpha | 1.18 | Stream Power (lb/ft s) | 0.22 | 1.79 | 0.11 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 1.88 | 5.00 | 10.44 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.46 | 0.59 | 2.68 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 425 Profile: 500 Yr

| E.G. Elev (ft) | 56.32 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.18 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.13 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 15.25 | 1074.49 | 171.73 |
| E.G. Slope (ft/ft) | 0.000823 | Area (sq ft) | 164.51 | 1074.49 | 282.50 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 19.37 | 3770.72 | 171.91 |
| Top Width (ft) | 236.42 | Top Width (ft) | 43.81 | 73.10 | 119.51 |
| Vel Total (ft/s) | 3.14 | Avg. Vel. (ft/s) | 1.27 | 3.51 | 1.00 |
| Max Chl Dpth (ft) | 18.57 | Hydr. Depth (ft) | 6.38 | 14.70 | 3.77 |
| Conv. Total (cfs) | 138125.2 | Conv. (cfs) | 675.2 | 131456.8 | 5993.1 |
| Length Wtd. (ft) | 51.26 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.26 | 0.71 | 0.18 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 0.34 | 2.49 | 0.19 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 2.13 | 5.32 | 11.90 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.47 | 0.59 | 2.79 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 375 Profile: 10 Yr

| E.G. Elev (ft) | 53.81 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.13 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.68 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 77.15 | 466.52 | 159.04 |
| E.G. Slope (ft/ft) | 0.002201 | Area (sq ft) | 77.15 | 466.52 | 159.04 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 90.22 | 1468.14 | 170.64 |
| Top Width (ft) | 197.13 | Top Width (ft) | 34.45 | 79.72 | 82.96 |
| Vel Total (ft/s) | 2.46 | Avg. Vel. (ft/s) | 1.17 | 3.15 | 1.07 |
| Max Chl Dpth (ft) | 7.93 | Hydr. Depth (ft) | 2.24 | 5.85 | 1.92 |
| Conv. Total (cfs) | 36856.8 | Conv. (cfs) | 1923.1 | 31296.1 | 3637.6 |
| Length Wtd. (ft) | 79.99 | Wetted Per. (ft) | 35.51 | 83.04 | 83.28 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.30 | 0.77 | 0.26 |
| Alpha | 1.42 | Stream Power (lb/ft s) | 0.35 | 2.43 | 0.28 |
| Frctn Loss (ft) | 0.21 | Cum Volume (acre-ft) | 1.05 | 3.15 | 5.66 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.39 | 0.51 | 2.26 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 375    Profile: 50 Yr

| E.G. Elev (ft) | 54.84 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.19 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.65 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 111.98 | 544.41 | 249.57 |
| E.G. Slope (ft/ft) | 0.002611 | Area (sq ft) | 111.98 | 544.41 | 249.57 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 174.43 | 2068.48 | 332.09 |
| Top Width (ft) | 223.81 | Top Width (ft) | 36.86 | 79.72 | 107.23 |
| Vel Total (ft/s) | 2.84 | Avg. Vel. (ft/s) | 1.56 | 3.80 | 1.33 |
| Max Chl Dpth (ft) | 8.90 | Hydr. Depth (ft) | 3.04 | 6.83 | 2.33 |
| Conv. Total (cfs) | 50393.5 | Conv. (cfs) | 3413.7 | 40480.7 | 6499.1 |
| Length Wtd. (ft) | 81.77 | Wetted Per. (ft) | 38.11 | 83.04 | 107.57 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.48 | 1.07 | 0.38 |
| Alpha | 1.48 | Stream Power (lb/ft s) | 0.75 | 4.06 | 0.50 |
| Frctn Loss (ft) | 0.23 | Cum Volume (acre-ft) | 1.44 | 3.65 | 7.97 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.41 | 0.51 | 2.41 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 375    Profile: 100 Yr

| E.G. Elev (ft) | 55.26 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.21 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.05 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 126.97 | 576.40 | 295.19 |
| E.G. Slope (ft/ft) | 0.002740 | Area (sq ft) | 126.97 | 576.40 | 295.19 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 216.28 | 2330.55 | 417.17 |
| Top Width (ft) | 237.76 | Top Width (ft) | 37.85 | 79.72 | 120.19 |
| Vel Total (ft/s) | 2.97 | Avg. Vel. (ft/s) | 1.70 | 4.04 | 1.41 |
| Max Chl Dpth (ft) | 9.30 | Hydr. Depth (ft) | 3.35 | 7.23 | 2.46 |
| Conv. Total (cfs) | 56622.9 | Conv. (cfs) | 4131.7 | 44521.8 | 7969.4 |
| Length Wtd. (ft) | 82.37 | Wetted Per. (ft) | 39.18 | 83.04 | 120.54 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.55 | 1.19 | 0.42 |
| Alpha | 1.51 | Stream Power (lb/ft s) | 0.94 | 4.80 | 0.59 |
| Frctn Loss (ft) | 0.24 | Cum Volume (acre-ft) | 1.61 | 3.85 | 8.96 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.42 | 0.51 | 2.46 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 375    Profile: 200 Yr

| E.G. Elev (ft) | 55.68 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.23 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.46 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 142.38 | 608.44 | 346.11 |
| E.G. Slope (ft/ft) | 0.002843 | Area (sq ft) | 142.38 | 608.44 | 346.11 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 261.88 | 2597.71 | 517.41 |
| Top Width (ft) | 251.73 | Top Width (ft) | 38.84 | 79.72 | 133.17 |
| Vel Total (ft/s) | 3.08 | Avg. Vel. (ft/s) | 1.84 | 4.27 | 1.49 |
| Max Chl Dpth (ft) | 9.71 | Hydr. Depth (ft) | 3.67 | 7.63 | 2.60 |
| Conv. Total (cfs) | 63338.7 | Conv. (cfs) | 4911.8 | 48722.4 | 9704.4 |
| Length Wtd. (ft) | 82.92 | Wetted Per. (ft) | 40.25 | 83.04 | 133.53 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.63 | 1.30 | 0.46 |
| Alpha | 1.54 | Stream Power (lb/ft s) | 1.15 | 5.55 | 0.69 |
| Frctn Loss (ft) | 0.24 | Cum Volume (acre-ft) | 1.79 | 4.06 | 9.97 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.43 | 0.51 | 2.51 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 375 Profile: 500 Yr

| E.G. Elev (ft) | 56.24 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.25 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.99 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 163.32 | 650.70 | 421.23 |
| E.G. Slope (ft/ft) | 0.002950 | Area (sq ft) | 163.32 | 650.70 | 421.23 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 327.69 | 2959.61 | 674.70 |
| Top Width (ft) | 270.16 | Top Width (ft) | 40.15 | 79.72 | 150.29 |
| Vel Total (ft/s) | 3.21 | Avg. Vel. (ft/s) | 2.01 | 4.55 | 1.60 |
| Max Chl Dpth (ft) | 10.24 | Hydr. Depth (ft) | 4.07 | 8.16 | 2.80 |
| Conv. Total (cfs) | 72947.3 | Conv. (cfs) | 6033.3 | 54491.6 | 12422.5 |
| Length Wtd. (ft) | 83.57 | Wetted Per. (ft) | 41.66 | 83.04 | 150.66 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.72 | 1.44 | 0.51 |
| Alpha | 1.58 | Stream Power (lb/ft s) | 1.45 | 6.56 | 0.82 |
| Frctn Loss (ft) | 0.24 | Cum Volume (acre-ft) | 2.02 | 4.33 | 11.33 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.44 | 0.51 | 2.57 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 300 Profile: 10 Yr

| E.G. Elev (ft) | 53.59 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.16 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.43 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 150.85 | 282.03 | 324.17 |
| E.G. Slope (ft/ft) | 0.003303 | Area (sq ft) | 150.85 | 282.03 | 324.17 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 229.50 | 1111.38 | 388.12 |
| Top Width (ft) | 302.72 | Top Width (ft) | 62.73 | 44.77 | 195.22 |
| Vel Total (ft/s) | 2.28 | Avg. Vel. (ft/s) | 1.52 | 3.94 | 1.20 |
| Max Chl Dpth (ft) | 7.98 | Hydr. Depth (ft) | 2.40 | 6.30 | 1.66 |
| Conv. Total (cfs) | 30086.6 | Conv. (cfs) | 3993.6 | 19339.3 | 6753.7 |
| Length Wtd. (ft) | 86.71 | Wetted Per. (ft) | 63.43 | 48.58 | 195.27 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.49 | 1.20 | 0.34 |
| Alpha | 2.03 | Stream Power (lb/ft s) | 0.75 | 4.72 | 0.41 |
| Frctn Loss (ft) | 0.11 | Cum Volume (acre-ft) | 0.84 | 2.50 | 5.08 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 0.30 | 0.40 | 1.93 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 300 Profile: 50 Yr

| E.G. Elev (ft) | 54.60 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.44 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 215.17 | 327.14 | 530.52 |
| E.G. Slope (ft/ft) | 0.003085 | Area (sq ft) | 215.17 | 327.14 | 530.52 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 391.01 | 1375.59 | 808.40 |
| Top Width (ft) | 321.13 | Top Width (ft) | 64.96 | 44.77 | 211.41 |
| Vel Total (ft/s) | 2.40 | Avg. Vel. (ft/s) | 1.82 | 4.20 | 1.52 |
| Max Chl Dpth (ft) | 8.99 | Hydr. Depth (ft) | 3.31 | 7.31 | 2.51 |
| Conv. Total (cfs) | 46357.2 | Conv. (cfs) | 7039.3 | 24764.5 | 14553.5 |
| Length Wtd. (ft) | 89.68 | Wetted Per. (ft) | 65.87 | 48.58 | 211.50 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.63 | 1.30 | 0.48 |
| Alpha | 1.85 | Stream Power (lb/ft s) | 1.14 | 5.45 | 0.74 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.15 | 2.90 | 7.04 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.32 | 0.40 | 2.03 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 300 Profile: 100 Yr

| E.G. Elev (ft) | 55.01 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.85 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 242.06 | 345.55 | 618.22 |
| E.G. Slope (ft/ft) | 0.002994 | Area (sq ft) | 242.06 | 345.55 | 618.22 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 464.04 | 1484.50 | 1015.46 |
| Top Width (ft) | 325.82 | Top Width (ft) | 65.86 | 44.77 | 215.19 |
| Vel Total (ft/s) | 2.46 | Avg. Vel. (ft/s) | 1.92 | 4.30 | 1.64 |
| Max Chl Dpth (ft) | 9.40 | Hydr. Depth (ft) | 3.68 | 7.72 | 2.87 |
| Conv. Total (cfs) | 54168.9 | Conv. (cfs) | 8480.6 | 27130.1 | 18558.2 |
| Length Wtd. (ft) | 90.67 | Wetted Per. (ft) | 66.86 | 48.58 | 215.30 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.68 | 1.33 | 0.54 |
| Alpha | 1.78 | Stream Power (lb/ft s) | 1.30 | 5.71 | 0.88 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.28 | 3.06 | 7.87 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.33 | 0.40 | 2.06 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 300 Profile: 200 Yr

| E.G. Elev (ft) | 55.43 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.26 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 269.38 | 363.98 | 707.62 |
| E.G. Slope (ft/ft) | 0.002911 | Area (sq ft) | 269.38 | 363.98 | 707.62 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 541.41 | 1596.17 | 1239.42 |
| Top Width (ft) | 330.52 | Top Width (ft) | 66.77 | 44.77 | 218.98 |
| Vel Total (ft/s) | 2.52 | Avg. Vel. (ft/s) | 2.01 | 4.39 | 1.75 |
| Max Chl Dpth (ft) | 9.81 | Hydr. Depth (ft) | 4.03 | 8.13 | 3.23 |
| Conv. Total (cfs) | 62593.6 | Conv. (cfs) | 10035.1 | 29585.5 | 22973.1 |
| Length Wtd. (ft) | 91.51 | Wetted Per. (ft) | 67.86 | 48.58 | 219.11 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.72 | 1.36 | 0.59 |
| Alpha | 1.71 | Stream Power (lb/ft s) | 1.45 | 5.97 | 1.03 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.42 | 3.22 | 8.72 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.34 | 0.40 | 2.09 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 300 Profile: 500 Yr

| E.G. Elev (ft) | 55.97 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.80 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 305.89 | 388.25 | 827.65 |
| E.G. Slope (ft/ft) | 0.002823 | Area (sq ft) | 305.89 | 388.25 | 827.65 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 650.61 | 1750.35 | 1561.04 |
| Top Width (ft) | 336.70 | Top Width (ft) | 67.97 | 44.77 | 223.96 |
| Vel Total (ft/s) | 2.60 | Avg. Vel. (ft/s) | 2.13 | 4.51 | 1.89 |
| Max Chl Dpth (ft) | 10.35 | Hydr. Depth (ft) | 4.50 | 8.67 | 3.70 |
| Conv. Total (cfs) | 74572.6 | Conv. (cfs) | 12245.7 | 32945.1 | 29381.9 |
| Length Wtd. (ft) | 92.46 | Wetted Per. (ft) | 69.17 | 48.58 | 224.13 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.78 | 1.41 | 0.65 |
| Alpha | 1.64 | Stream Power (lb/ft s) | 1.66 | 6.35 | 1.23 |
| Frctn Loss (ft) | 0.14 | Cum Volume (acre-ft) | 1.60 | 3.44 | 9.85 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.35 | 0.40 | 2.12 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 225 Profile: 10 Yr

| E.G. Elev (ft) | 53.45 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.40 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 203.71 | 453.52 | 735.61 |
| E.G. Slope (ft/ft) | 0.000683 | Area (sq ft) | 203.71 | 453.52 | 735.61 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 159.60 | 993.53 | 575.87 |
| Top Width (ft) | 381.89 | Top Width (ft) | 69.02 | 56.28 | 256.59 |
| Vel Total (ft/s) | 1.24 | Avg. Vel. (ft/s) | 0.78 | 2.19 | 0.78 |
| Max Chl Dpth (ft) | 9.30 | Hydr. Depth (ft) | 2.95 | 8.06 | 2.87 |
| Conv. Total (cfs) | 66180.1 | Conv. (cfs) | 6109.1 | 38028.8 | 22042.2 |
| Length Wtd. (ft) | 52.23 | Wetted Per. (ft) | 71.05 | 57.77 | 256.88 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.12 | 0.33 | 0.12 |
| Alpha | 1.96 | Stream Power (lb/ft s) | 0.10 | 0.73 | 0.10 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.52 | 1.87 | 3.68 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.18 | 0.31 | 1.33 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 225 Profile: 50 Yr

| E.G. Elev (ft) | 54.44 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.38 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 272.93 | 508.95 | 997.49 |
| E.G. Slope (ft/ft) | 0.000801 | Area (sq ft) | 272.93 | 508.95 | 997.49 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 274.52 | 1304.04 | 996.43 |
| Top Width (ft) | 399.87 | Top Width (ft) | 71.54 | 56.28 | 272.05 |
| Vel Total (ft/s) | 1.45 | Avg. Vel. (ft/s) | 1.01 | 2.56 | 1.00 |
| Max Chl Dpth (ft) | 10.28 | Hydr. Depth (ft) | 3.81 | 9.04 | 3.67 |
| Conv. Total (cfs) | 91004.3 | Conv. (cfs) | 9702.1 | 46086.8 | 35215.3 |
| Length Wtd. (ft) | 52.55 | Wetted Per. (ft) | 73.76 | 57.77 | 272.38 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.18 | 0.44 | 0.18 |
| Alpha | 1.82 | Stream Power (lb/ft s) | 0.19 | 1.13 | 0.18 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.71 | 2.18 | 5.02 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.20 | 0.31 | 1.39 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 225 Profile: 100 Yr

| E.G. Elev (ft) | 54.85 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.79 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 302.13 | 531.76 | 1108.36 |
| E.G. Slope (ft/ft) | 0.000834 | Area (sq ft) | 302.13 | 531.76 | 1108.36 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 328.64 | 1431.95 | 1203.41 |
| Top Width (ft) | 403.93 | Top Width (ft) | 72.58 | 56.28 | 275.07 |
| Vel Total (ft/s) | 1.53 | Avg. Vel. (ft/s) | 1.09 | 2.69 | 1.09 |
| Max Chl Dpth (ft) | 10.69 | Hydr. Depth (ft) | 4.16 | 9.45 | 4.03 |
| Conv. Total (cfs) | 102626.6 | Conv. (cfs) | 11379.0 | 49580.3 | 41667.3 |
| Length Wtd. (ft) | 52.66 | Wetted Per. (ft) | 74.87 | 57.77 | 275.42 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.21 | 0.48 | 0.21 |
| Alpha | 1.77 | Stream Power (lb/ft s) | 0.23 | 1.29 | 0.23 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.79 | 2.30 | 5.58 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.20 | 0.31 | 1.41 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 225    Profile: 200 Yr

| E.G. Elev (ft) | 55.26 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.20 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 331.90 | 554.68 | 1221.00 |
| E.G. Slope (ft/ft) | 0.000863 | Area (sq ft) | 331.90 | 554.68 | 1221.00 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 387.05 | 1562.40 | 1427.55 |
| Top Width (ft) | 408.01 | Top Width (ft) | 73.63 | 56.28 | 278.10 |
| Vel Total (ft/s) | 1.60 | Avg. Vel. (ft/s) | 1.17 | 2.82 | 1.17 |
| Max Chl Dpth (ft) | 11.10 | Hydr. Depth (ft) | 4.51 | 9.86 | 4.39 |
| Conv. Total (cfs) | 114972.1 | Conv. (cfs) | 13177.4 | 53192.9 | 48601.8 |
| Length Wtd. (ft) | 52.75 | Wetted Per. (ft) | 75.99 | 57.77 | 278.48 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.24 | 0.52 | 0.24 |
| Alpha | 1.72 | Stream Power (lb/ft s) | 0.27 | 1.46 | 0.28 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.87 | 2.43 | 6.16 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.21 | 0.31 | 1.43 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 225    Profile: 500 Yr

| E.G. Elev (ft) | 55.81 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.73 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 371.83 | 584.92 | 1371.48 |
| E.G. Slope (ft/ft) | 0.000897 | Area (sq ft) | 371.83 | 584.92 | 1371.48 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 470.93 | 1740.84 | 1750.23 |
| Top Width (ft) | 413.39 | Top Width (ft) | 75.01 | 56.28 | 282.10 |
| Vel Total (ft/s) | 1.70 | Avg. Vel. (ft/s) | 1.27 | 2.98 | 1.28 |
| Max Chl Dpth (ft) | 11.63 | Hydr. Depth (ft) | 4.96 | 10.39 | 4.86 |
| Conv. Total (cfs) | 132260.4 | Conv. (cfs) | 15720.7 | 58113.0 | 58426.7 |
| Length Wtd. (ft) | 52.86 | Wetted Per. (ft) | 77.47 | 57.77 | 282.52 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.27 | 0.57 | 0.27 |
| Alpha | 1.66 | Stream Power (lb/ft s) | 0.34 | 1.69 | 0.35 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.99 | 2.60 | 6.93 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.22 | 0.31 | 1.45 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 175    Profile: 10 Yr

| E.G. Elev (ft) | 53.40 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.37 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 59.03 | 726.02 | 635.33 |
| E.G. Slope (ft/ft) | 0.000744 | Area (sq ft) | 59.03 | 726.02 | 635.33 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 44.61 | 1179.68 | 504.71 |
| Top Width (ft) | 400.84 | Top Width (ft) | 22.20 | 149.52 | 229.12 |
| Vel Total (ft/s) | 1.22 | Avg. Vel. (ft/s) | 0.76 | 1.62 | 0.79 |
| Max Chl Dpth (ft) | 9.70 | Hydr. Depth (ft) | 2.66 | 4.86 | 2.77 |
| Conv. Total (cfs) | 63406.4 | Conv. (cfs) | 1636.0 | 43261.7 | 18508.8 |
| Length Wtd. (ft) | 77.96 | Wetted Per. (ft) | 23.18 | 154.37 | 231.43 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.12 | 0.22 | 0.13 |
| Alpha | 1.35 | Stream Power (lb/ft s) | 0.09 | 0.35 | 0.10 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 0.34 | 1.19 | 2.81 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.12 | 0.19 | 1.03 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 175    Profile: 50 Yr

| E.G. Elev (ft) | 54.40 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.35 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 81.86 | 872.81 | 867.54 |
| E.G. Slope (ft/ft) | 0.000794 | Area (sq ft) | 81.86 | 872.81 | 867.54 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 74.61 | 1657.16 | 843.23 |
| Top Width (ft) | 416.81 | Top Width (ft) | 24.30 | 149.52 | 242.98 |
| Vel Total (ft/s) | 1.41 | Avg. Vel. (ft/s) | 0.91 | 1.90 | 0.97 |
| Max Chl Dpth (ft) | 10.68 | Hydr. Depth (ft) | 3.37 | 5.84 | 3.57 |
| Conv. Total (cfs) | 91370.6 | Conv. (cfs) | 2647.5 | 58802.2 | 29921.0 |
| Length Wtd. (ft) | 79.83 | Wetted Per. (ft) | 25.49 | 154.37 | 245.33 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.16 | 0.28 | 0.18 |
| Alpha | 1.33 | Stream Power (lb/ft s) | 0.15 | 0.53 | 0.17 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 0.46 | 1.38 | 3.84 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.13 | 0.19 | 1.07 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 175    Profile: 100 Yr

| E.G. Elev (ft) | 54.80 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.76 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 91.86 | 933.25 | 966.69 |
| E.G. Slope (ft/ft) | 0.000808 | Area (sq ft) | 91.86 | 933.25 | 966.69 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 88.99 | 1868.99 | 1006.02 |
| Top Width (ft) | 422.32 | Top Width (ft) | 25.17 | 149.52 | 247.63 |
| Vel Total (ft/s) | 1.49 | Avg. Vel. (ft/s) | 0.97 | 2.00 | 1.04 |
| Max Chl Dpth (ft) | 11.09 | Hydr. Depth (ft) | 3.65 | 6.24 | 3.90 |
| Conv. Total (cfs) | 104261.5 | Conv. (cfs) | 3130.4 | 65743.5 | 35387.7 |
| Length Wtd. (ft) | 80.45 | Wetted Per. (ft) | 26.45 | 154.37 | 249.99 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.18 | 0.31 | 0.20 |
| Alpha | 1.32 | Stream Power (lb/ft s) | 0.17 | 0.61 | 0.20 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 0.51 | 1.46 | 4.27 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.13 | 0.19 | 1.08 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 175    Profile: 200 Yr

| E.G. Elev (ft) | 55.21 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.16 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 102.26 | 994.00 | 1068.26 |
| E.G. Slope (ft/ft) | 0.000819 | Area (sq ft) | 102.26 | 994.00 | 1068.26 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 104.64 | 2090.56 | 1181.80 |
| Top Width (ft) | 427.86 | Top Width (ft) | 26.03 | 149.52 | 252.31 |
| Vel Total (ft/s) | 1.56 | Avg. Vel. (ft/s) | 1.02 | 2.10 | 1.11 |
| Max Chl Dpth (ft) | 11.49 | Hydr. Depth (ft) | 3.93 | 6.65 | 4.23 |
| Conv. Total (cfs) | 117969.9 | Conv. (cfs) | 3655.4 | 73030.2 | 41284.3 |
| Length Wtd. (ft) | 80.99 | Wetted Per. (ft) | 27.41 | 154.37 | 254.68 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.19 | 0.33 | 0.21 |
| Alpha | 1.31 | Stream Power (lb/ft s) | 0.20 | 0.69 | 0.24 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 0.57 | 1.54 | 4.71 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.14 | 0.19 | 1.09 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 175    Profile: 500 Yr

| E.G. Elev (ft) | 55.76 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.70 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 116.53 | 1074.16 | 1205.17 |
| E.G. Slope (ft/ft) | 0.000834 | Area (sq ft) | 116.53 | 1074.16 | 1205.17 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 127.35 | 2400.11 | 1434.55 |
| Top Width (ft) | 435.17 | Top Width (ft) | 27.18 | 149.52 | 258.47 |
| Vel Total (ft/s) | 1.65 | Avg. Vel. (ft/s) | 1.09 | 2.23 | 1.19 |
| Max Chl Dpth (ft) | 12.03 | Hydr. Depth (ft) | 4.29 | 7.18 | 4.66 |
| Conv. Total (cfs) | 137190.5 | Conv. (cfs) | 4409.5 | 83107.5 | 49673.5 |
| Length Wtd. (ft) | 81.59 | Wetted Per. (ft) | 28.67 | 154.37 | 260.87 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.21 | 0.36 | 0.24 |
| Alpha | 1.31 | Stream Power (lb/ft s) | 0.23 | 0.81 | 0.29 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 0.64 | 1.65 | 5.30 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.14 | 0.19 | 1.11 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 110    Profile: 10 Yr

| E.G. Elev (ft) | 53.34 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.28 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 44.93 | 355.57 | 901.32 |
| E.G. Slope (ft/ft) | 0.000944 | Area (sq ft) | 44.93 | 355.57 | 901.32 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 35.90 | 906.83 | 786.27 |
| Top Width (ft) | 400.45 | Top Width (ft) | 16.87 | 45.26 | 338.32 |
| Vel Total (ft/s) | 1.33 | Avg. Vel. (ft/s) | 0.80 | 2.55 | 0.87 |
| Max Chl Dpth (ft) | 9.11 | Hydr. Depth (ft) | 2.66 | 7.86 | 2.66 |
| Conv. Total (cfs) | 56278.1 | Conv. (cfs) | 1168.5 | 29516.8 | 25592.8 |
| Length Wtd. (ft) | 55.10 | Wetted Per. (ft) | 19.40 | 45.98 | 341.21 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.14 | 0.46 | 0.16 |
| Alpha | 2.14 | Stream Power (lb/ft s) | 0.11 | 1.16 | 0.14 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.21 | 0.39 | 1.10 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.07 | 0.05 | 0.39 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 110    Profile: 50 Yr

| E.G. Elev (ft) | 54.32 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.25 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 62.50 | 399.72 | 1239.26 |
| E.G. Slope (ft/ft) | 0.001035 | Area (sq ft) | 62.50 | 399.72 | 1239.26 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 60.11 | 1153.98 | 1360.91 |
| Top Width (ft) | 417.37 | Top Width (ft) | 19.16 | 45.26 | 352.95 |
| Vel Total (ft/s) | 1.51 | Avg. Vel. (ft/s) | 0.96 | 2.89 | 1.10 |
| Max Chl Dpth (ft) | 10.08 | Hydr. Depth (ft) | 3.26 | 8.83 | 3.51 |
| Conv. Total (cfs) | 80049.0 | Conv. (cfs) | 1868.7 | 35873.9 | 42306.5 |
| Length Wtd. (ft) | 54.48 | Wetted Per. (ft) | 21.90 | 45.98 | 355.87 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.18 | 0.56 | 0.22 |
| Alpha | 1.92 | Stream Power (lb/ft s) | 0.18 | 1.62 | 0.25 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 0.29 | 0.43 | 1.49 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.08 | 0.05 | 0.40 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 110 Profile: 100 Yr

| E.G. Elev (ft) | 54.73 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.66 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 70.42 | 417.97 | 1382.24 |
| E.G. Slope (ft/ft) | 0.001054 | Area (sq ft) | 70.42 | 417.97 | 1382.24 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 71.78 | 1254.79 | 1637.43 |
| Top Width (ft) | 421.71 | Top Width (ft) | 20.11 | 45.26 | 356.34 |
| Vel Total (ft/s) | 1.58 | Avg. Vel. (ft/s) | 1.02 | 3.00 | 1.18 |
| Max Chl Dpth (ft) | 10.49 | Hydr. Depth (ft) | 3.50 | 9.23 | 3.88 |
| Conv. Total (cfs) | 91284.3 | Conv. (cfs) | 2210.7 | 38644.6 | 50429.0 |
| Length Wtd. (ft) | 54.29 | Wetted Per. (ft) | 22.93 | 45.98 | 359.28 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.20 | 0.60 | 0.25 |
| Alpha | 1.84 | Stream Power (lb/ft s) | 0.21 | 1.80 | 0.30 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 0.32 | 0.45 | 1.65 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.08 | 0.05 | 0.41 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 110 Profile: 200 Yr

| E.G. Elev (ft) | 55.14 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.08 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.06 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 78.77 | 436.33 | 1527.50 |
| E.G. Slope (ft/ft) | 0.001069 | Area (sq ft) | 78.77 | 436.33 | 1527.50 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 84.59 | 1357.27 | 1935.14 |
| Top Width (ft) | 426.07 | Top Width (ft) | 21.07 | 45.26 | 359.75 |
| Vel Total (ft/s) | 1.65 | Avg. Vel. (ft/s) | 1.07 | 3.11 | 1.27 |
| Max Chl Dpth (ft) | 10.89 | Hydr. Depth (ft) | 3.74 | 9.64 | 4.25 |
| Conv. Total (cfs) | 103293.5 | Conv. (cfs) | 2587.4 | 41515.3 | 59190.9 |
| Length Wtd. (ft) | 54.12 | Wetted Per. (ft) | 23.97 | 45.98 | 362.71 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.22 | 0.63 | 0.28 |
| Alpha | 1.77 | Stream Power (lb/ft s) | 0.24 | 1.97 | 0.36 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 0.35 | 0.47 | 1.82 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.08 | 0.05 | 0.41 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 110 Profile: 500 Yr

| E.G. Elev (ft) | 55.68 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.08 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.60 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 90.39 | 460.56 | 1721.28 |
| E.G. Slope (ft/ft) | 0.001087 | Area (sq ft) | 90.39 | 460.56 | 1721.28 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 103.36 | 1497.43 | 2361.21 |
| Top Width (ft) | 431.83 | Top Width (ft) | 22.33 | 45.26 | 364.24 |
| Vel Total (ft/s) | 1.74 | Avg. Vel. (ft/s) | 1.14 | 3.25 | 1.37 |
| Max Chl Dpth (ft) | 11.43 | Hydr. Depth (ft) | 4.05 | 10.18 | 4.73 |
| Conv. Total (cfs) | 120197.1 | Conv. (cfs) | 3135.7 | 45428.2 | 71633.3 |
| Length Wtd. (ft) | 53.94 | Wetted Per. (ft) | 25.34 | 45.98 | 367.24 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.24 | 0.68 | 0.32 |
| Alpha | 1.69 | Stream Power (lb/ft s) | 0.28 | 2.21 | 0.44 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 0.39 | 0.50 | 2.04 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.09 | 0.05 | 0.41 |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 50    Profile: 10 Yr

| E.G. Elev (ft) | 53.28 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.24 | Reach Len. (ft) |  |  |  |
| Crit W.S. (ft) | 51.05 | Flow Area (sq ft) | 201.24 | 203.92 | 1063.74 |
| E.G. Slope (ft/ft) | 0.001000 | Area (sq ft) | 201.24 | 203.92 | 1063.74 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 192.78 | 515.60 | 1020.61 |
| Top Width (ft) | 458.53 | Top Width (ft) | 67.71 | 26.62 | 364.20 |
| Vel Total (ft/s) | 1.18 | Avg. Vel. (ft/s) | 0.96 | 2.53 | 0.96 |
| Max Chl Dpth (ft) | 8.61 | Hydr. Depth (ft) | 2.97 | 7.66 | 2.92 |
| Conv. Total (cfs) | 54673.5 | Conv. (cfs) | 6096.1 | 16304.1 | 32273.3 |
| Length Wtd. (ft) |  | Wetted Per. (ft) | 69.14 | 27.90 | 364.60 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.18 | 0.46 | 0.18 |
| Alpha | 1.84 | Stream Power (lb/ft s) | 0.17 | 1.15 | 0.17 |
| Frctn Loss (ft) |  | Cum Volume (acre-ft) |  |  |  |
| C & E Loss (ft) |  | Cum SA (acres) |  |  |  |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 50    Profile: 50 Yr

| E.G. Elev (ft) | 54.26 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.21 | Reach Len. (ft) |  |  |  |
| Crit W.S. (ft) | 51.44 | Flow Area (sq ft) | 268.61 | 229.93 | 1421.53 |
| E.G. Slope (ft/ft) | 0.001001 | Area (sq ft) | 268.61 | 229.93 | 1421.53 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 303.26 | 629.96 | 1641.78 |
| Top Width (ft) | 465.71 | Top Width (ft) | 70.55 | 26.62 | 368.54 |
| Vel Total (ft/s) | 1.34 | Avg. Vel. (ft/s) | 1.13 | 2.74 | 1.15 |
| Max Chl Dpth (ft) | 9.58 | Hydr. Depth (ft) | 3.81 | 8.64 | 3.86 |
| Conv. Total (cfs) | 81406.3 | Conv. (cfs) | 9587.2 | 19915.8 | 51903.4 |
| Length Wtd. (ft) |  | Wetted Per. (ft) | 72.15 | 27.90 | 369.05 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.23 | 0.51 | 0.24 |
| Alpha | 1.58 | Stream Power (lb/ft s) | 0.26 | 1.41 | 0.28 |
| Frctn Loss (ft) |  | Cum Volume (acre-ft) |  |  |  |
| C & E Loss (ft) |  | Cum SA (acres) |  |  |  |

Plan: Existing Conditions    3 Mile River    3 Mile River Bas  RS: 50    Profile: 100 Yr

| E.G. Elev (ft) | 54.66 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.62 | Reach Len. (ft) |  |  |  |
| Crit W.S. (ft) | 51.56 | Flow Area (sq ft) | 297.46 | 240.68 | 1570.82 |
| E.G. Slope (ft/ft) | 0.001001 | Area (sq ft) | 297.46 | 240.68 | 1570.82 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 353.33 | 680.07 | 1930.60 |
| Top Width (ft) | 470.25 | Top Width (ft) | 72.44 | 26.62 | 371.19 |
| Vel Total (ft/s) | 1.41 | Avg. Vel. (ft/s) | 1.19 | 2.83 | 1.23 |
| Max Chl Dpth (ft) | 9.99 | Hydr. Depth (ft) | 4.11 | 9.04 | 4.23 |
| Conv. Total (cfs) | 93665.0 | Conv. (cfs) | 11165.5 | 21491.0 | 61008.5 |
| Length Wtd. (ft) |  | Wetted Per. (ft) | 74.09 | 27.90 | 371.73 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.25 | 0.54 | 0.26 |
| Alpha | 1.51 | Stream Power (lb/ft s) | 0.30 | 1.52 | 0.32 |
| Frctn Loss (ft) |  | Cum Volume (acre-ft) |  |  |  |
| C & E Loss (ft) |  | Cum SA (acres) |  |  |  |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 50 Profile: 200 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.07 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.02 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 51.71 | Flow Area (sq ft) | 327.28 | 251.49 | 1722.15 |
| E.G. Slope (ft/ft) | 0.001000 | Area (sq ft) | 327.28 | 251.49 | 1722.15 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 407.00 | 731.42 | 2238.59 |
| Top Width (ft) | 474.82 | Top Width (ft) | 74.35 | 26.62 | 373.85 |
| Vel Total (ft/s) | 1.47 | Avg. Vel. (ft/s) | 1.24 | 2.91 | 1.30 |
| Max Chl Dpth (ft) | 10.39 | Hydr. Depth (ft) | 4.40 | 9.45 | 4.61 |
| Conv. Total (cfs) | 106766.4 | Conv. (cfs) | 12867.5 | 23124.4 | 70774.6 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 76.04 | 27.90 | 374.42 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.27 | 0.56 | 0.29 |
| Alpha | 1.46 | Stream Power (lb/ft s) | 0.33 | 1.64 | 0.37 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 50 Profile: 500 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.61 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.56 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 51.83 | Flow Area (sq ft) | 367.81 | 265.76 | 1923.48 |
| E.G. Slope (ft/ft) | 0.001001 | Area (sq ft) | 367.81 | 265.76 | 1923.48 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 483.79 | 802.27 | 2675.94 |
| Top Width (ft) | 480.85 | Top Width (ft) | 76.87 | 26.62 | 377.36 |
| Vel Total (ft/s) | 1.55 | Avg. Vel. (ft/s) | 1.32 | 3.02 | 1.39 |
| Max Chl Dpth (ft) | 10.93 | Hydr. Depth (ft) | 4.78 | 9.98 | 5.10 |
| Conv. Total (cfs) | 125200.8 | Conv. (cfs) | 15288.1 | 25352.1 | 84560.8 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 78.62 | 27.90 | 377.97 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.29 | 0.60 | 0.32 |
| Alpha | 1.40 | Stream Power (lb/ft s) | 0.38 | 1.80 | 0.44 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 Profile: 10 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 54.47 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 54.13 | E.G. Elev (ft) | 54.28 | 54.11 |
| Q Total (cfs) | 1729.00 | W.S. Elev (ft) | 53.62 | 53.63 |
| Q Bridge (cfs) | 1729.00 | Crit W.S. (ft) | 50.37 | 49.66 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 10.43 | 11.25 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 5.84 | 5.44 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 295.94 | 317.87 |
| Weir Submerg | | Froude # Chl | 0.42 | 0.35 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 1473.31 | 1601.94 |
| Min El Weir Flow (ft) | 64.80 | Hydr Depth (ft) | 6.89 | 7.45 |
| Min El Prs (ft) | 62.09 | W.P. Total (ft) | 48.20 | 49.57 |
| Delta EG (ft) | 0.58 | Conv. Total (cfs) | 21468.6 | 23642.0 |
| Delta WS (ft) | 0.34 | Top Width (ft) | 42.99 | 42.99 |
| BR Open Area (sq ft) | 655.08 | Frctn Loss (ft) | 0.08 | 0.03 |
| BR Open Vel (ft/s) | 5.84 | C & E Loss (ft) | 0.09 | 0.19 |
| BR Sluice Coef | | Shear Total (lb/sq ft) | 2.49 | 2.14 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 14.53 | 11.65 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 Profile: 50 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 55.95 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 55.38 | E.G. Elev (ft) | 55.63 | 55.35 |
| Q Total (cfs) | 2575.00 | W.S. Elev (ft) | 54.48 | 54.50 |
| Q Bridge (cfs) | 2575.00 | Crit W.S. (ft) | 51.84 | 50.96 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 11.28 | 12.12 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 7.74 | 7.25 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 332.74 | 355.04 |
| Weir Submerg | | Froude # Chl | 0.53 | 0.45 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 2074.65 | 2188.07 |
| Min El Weir Flow (ft) | 64.80 | Hydr Depth (ft) | 7.75 | 8.32 |
| Min El Prs (ft) | 62.09 | W.P. Total (ft) | 49.06 | 50.45 |
| Delta EG (ft) | 0.98 | Conv. Total (cfs) | 25609.9 | 27918.6 |
| Delta WS (ft) | 0.59 | Top Width (ft) | 42.99 | 42.99 |
| BR Open Area (sq ft) | 655.08 | Frctn Loss (ft) | 0.13 | 0.05 |
| BR Open Vel (ft/s) | 7.74 | C & E Loss (ft) | 0.15 | 0.34 |
| BR Sluice Coef | | Shear Total (lb/sq ft) | 4.28 | 3.74 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 33.13 | 27.11 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 Profile: 100 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 56.59 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 55.91 | E.G. Elev (ft) | 56.21 | 55.88 |
| Q Total (cfs) | 2964.00 | W.S. Elev (ft) | 54.81 | 54.84 |
| Q Bridge (cfs) | 2964.00 | Crit W.S. (ft) | 52.36 | 51.47 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 11.61 | 12.46 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 8.54 | 8.02 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 346.88 | 369.48 |
| Weir Submerg | | Froude # Chl | 0.57 | 0.48 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 2369.06 | 2471.82 |
| Min El Weir Flow (ft) | 64.80 | Hydr Depth (ft) | 8.08 | 8.66 |
| Min El Prs (ft) | 62.09 | W.P. Total (ft) | 49.38 | 50.78 |
| Delta EG (ft) | 1.18 | Conv. Total (cfs) | 27278.5 | 29641.2 |
| Delta WS (ft) | 0.72 | Top Width (ft) | 42.99 | 42.99 |
| BR Open Area (sq ft) | 655.08 | Frctn Loss (ft) | 0.15 | 0.06 |
| BR Open Vel (ft/s) | 8.54 | C & E Loss (ft) | 0.18 | 0.41 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 Profile: 100 Yr (Continued)

| | | | | |
|---|---|---|---|---|
| BR Sluice Coef | | Shear Total (lb/sq ft) | 5.18 | 4.54 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 44.24 | 36.43 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 Profile: 200 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 57.26 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 56.46 | E.G. Elev (ft) | 56.81 | 56.42 |
| Q Total (cfs) | 3377.00 | W.S. Elev (ft) | 55.13 | 55.17 |
| Q Bridge (cfs) | 3377.00 | Crit W.S. (ft) | 52.89 | 52.01 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 11.93 | 12.79 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 9.37 | 8.81 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 360.37 | 383.38 |
| Weir Submerg | | Froude # Chl | 0.62 | 0.52 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 2693.79 | 2782.88 |
| Min El Weir Flow (ft) | 64.80 | Hydr Depth (ft) | 8.39 | 8.99 |
| Min El Prs (ft) | 62.09 | W.P. Total (ft) | 49.70 | 51.11 |
| Delta EG (ft) | 1.40 | Conv. Total (cfs) | 28908.9 | 31329.4 |
| Delta WS (ft) | 0.87 | Top Width (ft) | 42.99 | 42.99 |
| BR Open Area (sq ft) | 655.08 | Frctn Loss (ft) | 0.17 | 0.07 |
| BR Open Vel (ft/s) | 9.37 | C & E Loss (ft) | 0.21 | 0.49 |
| BR Sluice Coef | | Shear Total (lb/sq ft) | 6.18 | 5.44 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 57.89 | 47.93 |

Plan: Existing Conditions 3 Mile River 3 Mile River Bas RS: 503 Profile: 500 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 58.19 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 57.23 | E.G. Elev (ft) | 57.63 | 57.15 |
| Q Total (cfs) | 3962.00 | W.S. Elev (ft) | 55.51 | 55.57 |
| Q Bridge (cfs) | 3962.00 | Crit W.S. (ft) | 53.59 | 52.69 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 12.31 | 13.19 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 10.51 | 9.89 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 376.96 | 400.70 |
| Weir Submerg | | Froude # Chl | 0.68 | 0.57 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 3174.29 | 3239.64 |
| Min El Weir Flow (ft) | 64.80 | Hydr Depth (ft) | 8.78 | 9.39 |
| Min El Prs (ft) | 62.09 | W.P. Total (ft) | 50.09 | 51.52 |
| Delta EG (ft) | 1.75 | Conv. Total (cfs) | 30965.0 | 33474.8 |
| Delta WS (ft) | 1.13 | Top Width (ft) | 42.99 | 42.99 |
| BR Open Area (sq ft) | 655.08 | Frctn Loss (ft) | 0.21 | 0.09 |
| BR Open Vel (ft/s) | 10.51 | C & E Loss (ft) | 0.27 | 0.62 |
| BR Sluice Coef | | Shear Total (lb/sq ft) | 7.69 | 6.80 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 80.85 | 67.26 |

# APPENDIX F:

## PROPOSED HEC-RAS MODEL AND RESULTS

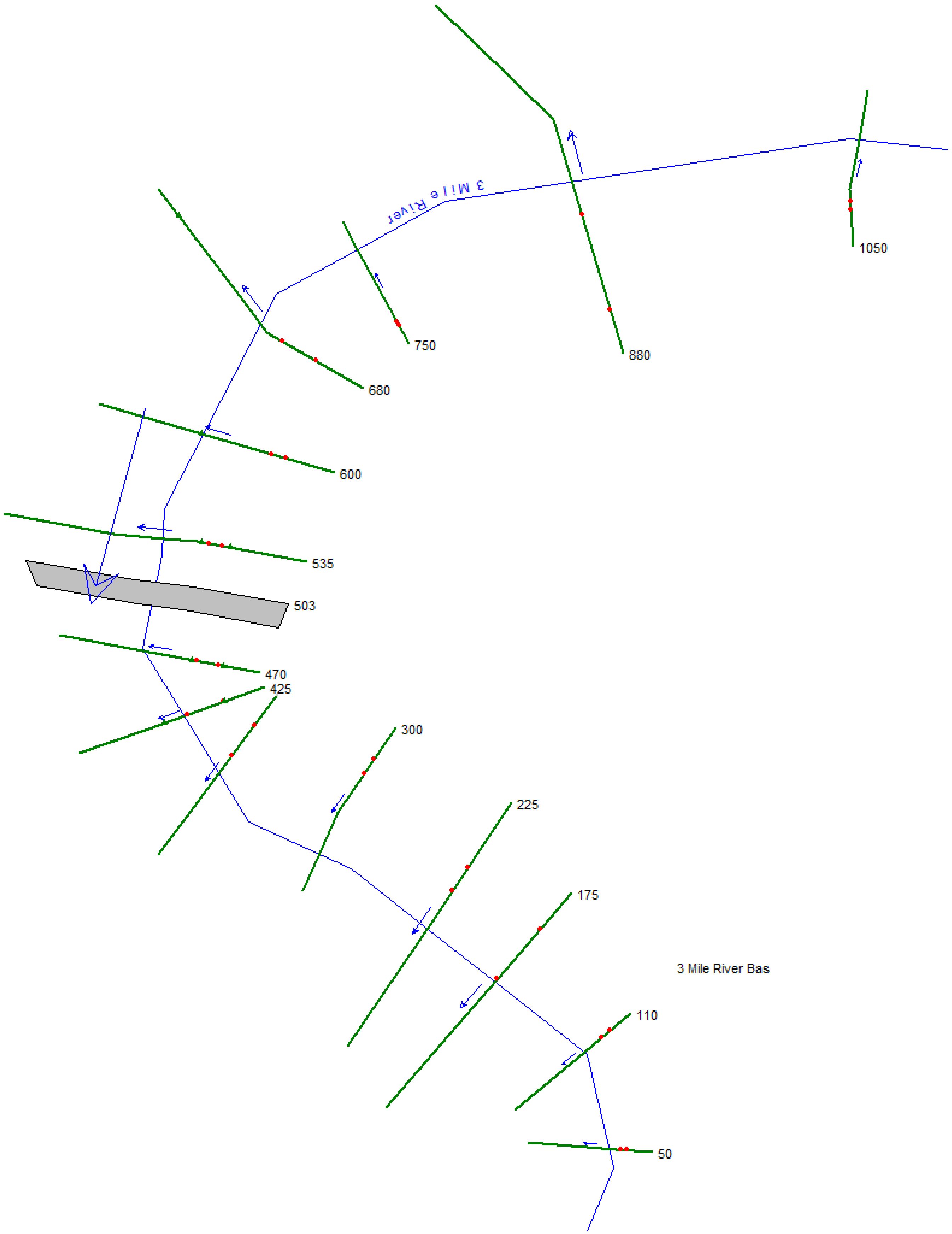
Geometry Plan

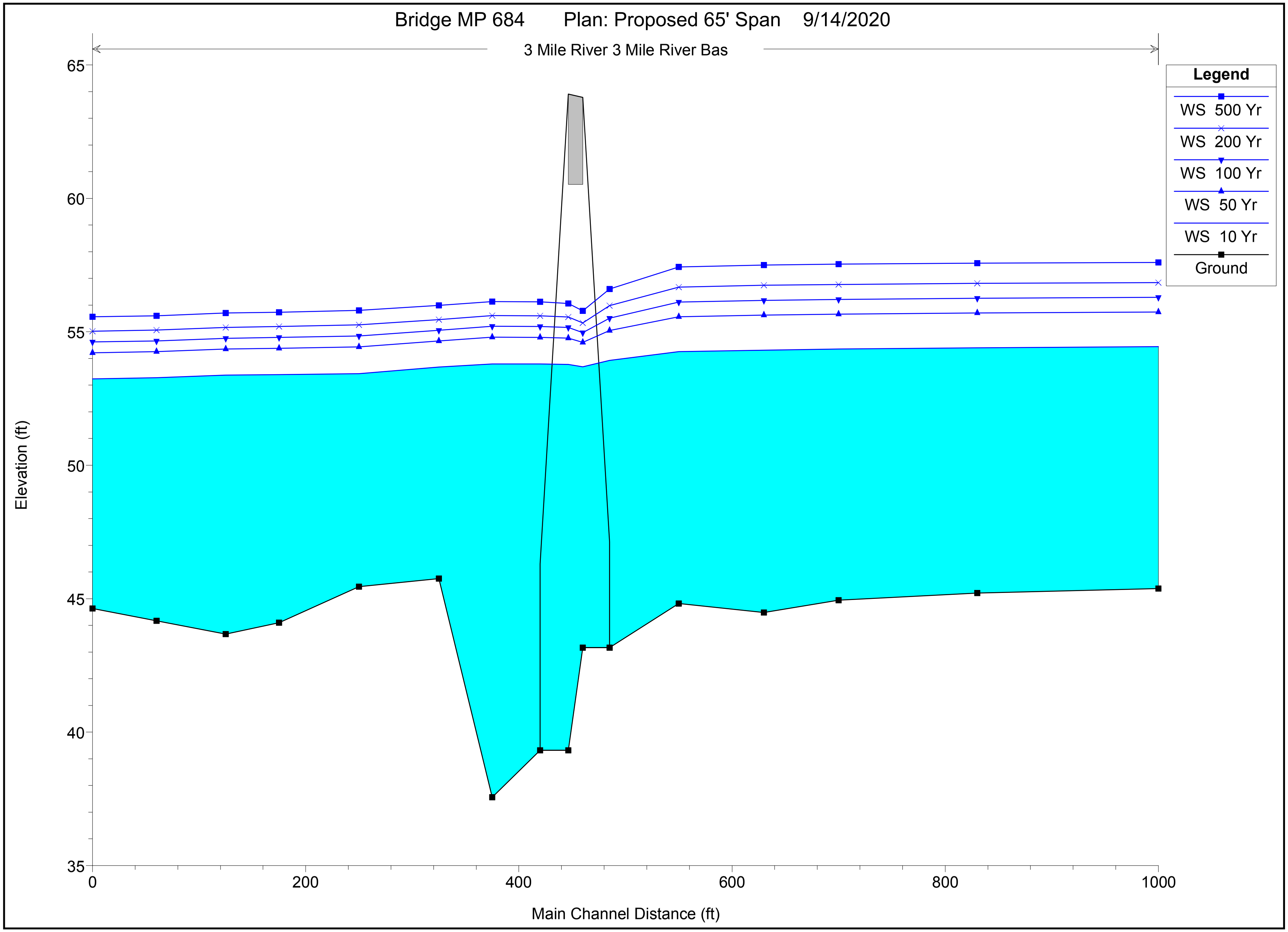
Stream Profile

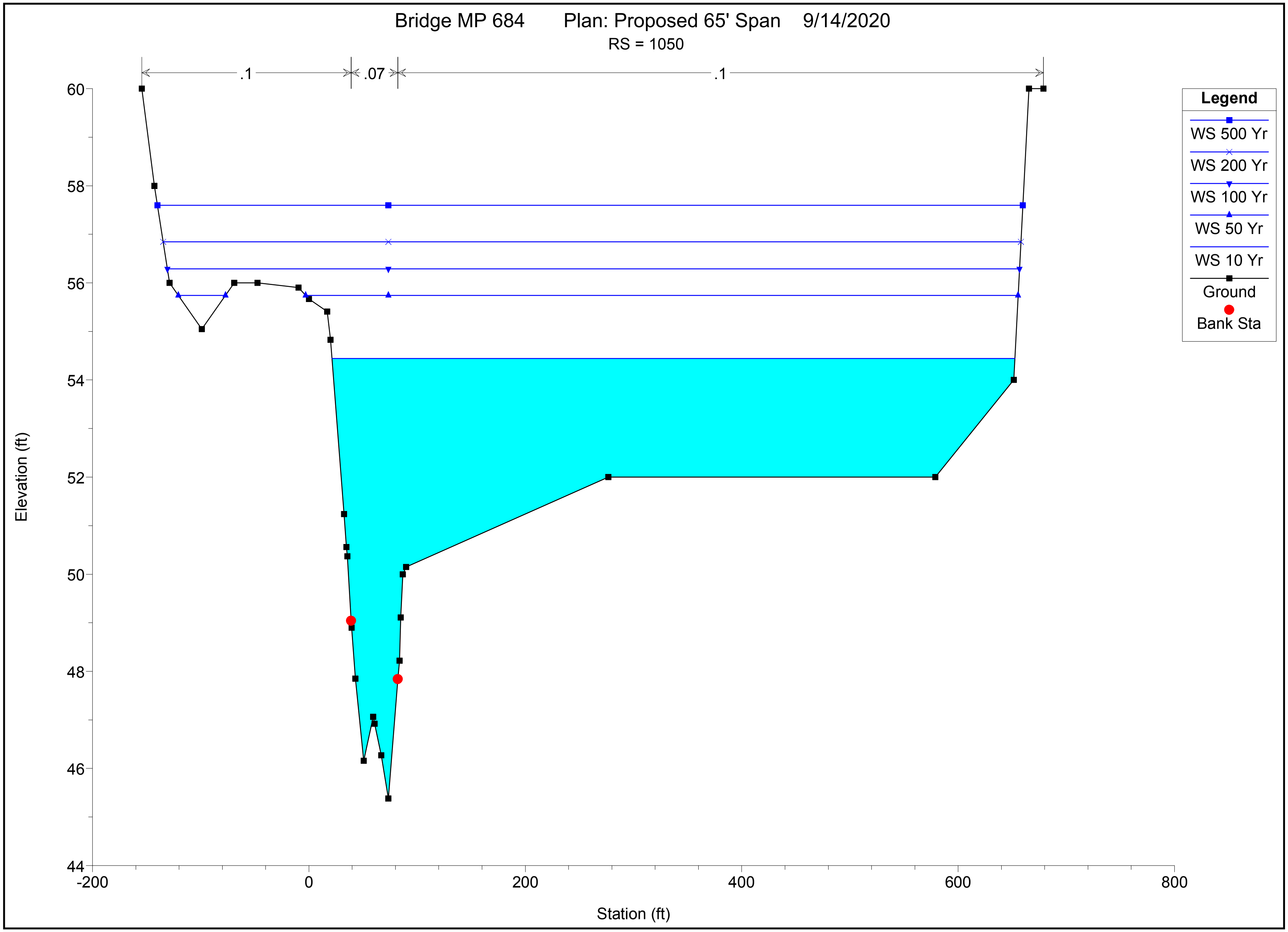
Stream Cross Sections

Cross Sections Output

Detailed Bridge Output

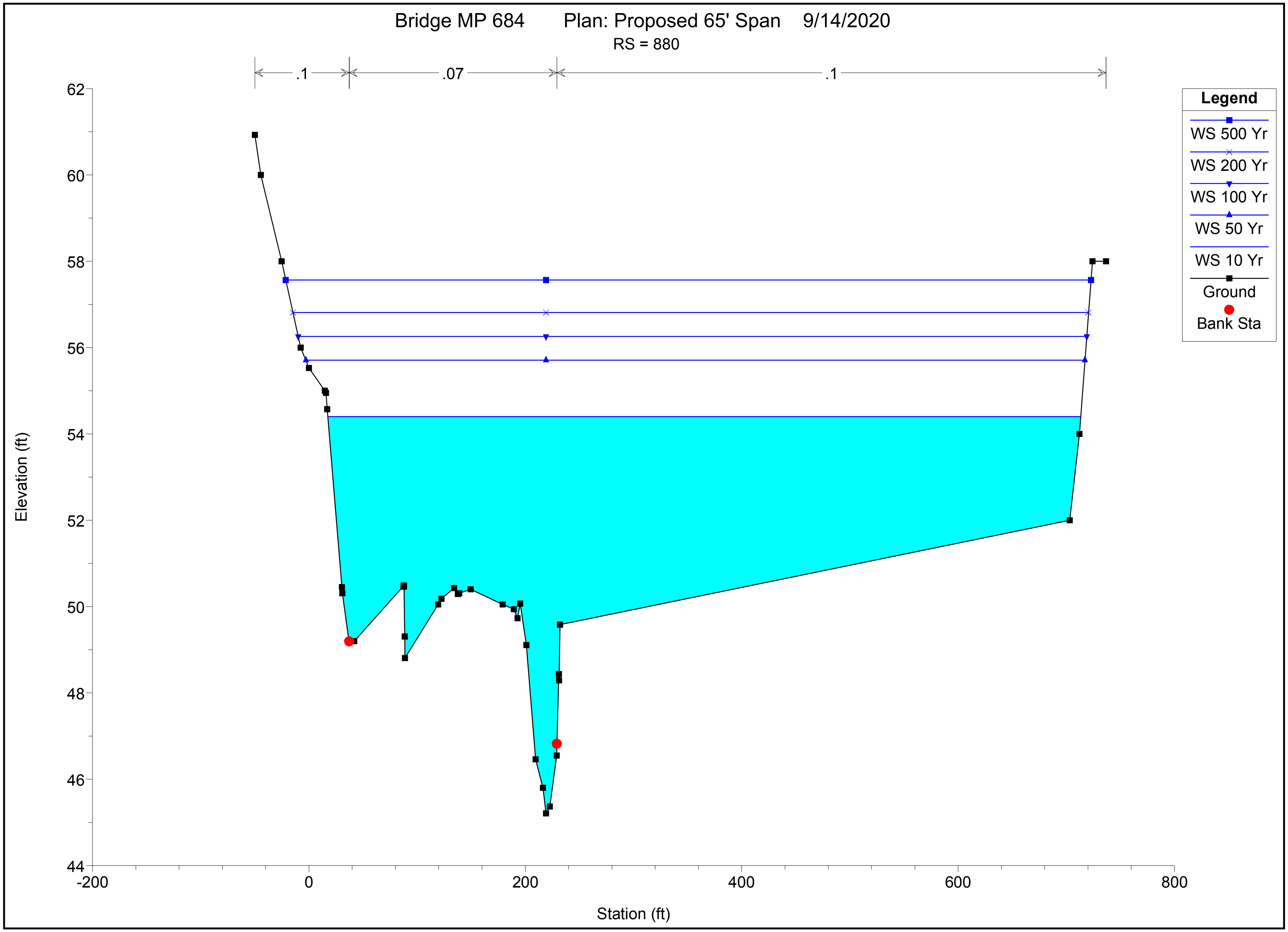

3 Mile River
3 Mile River Bas

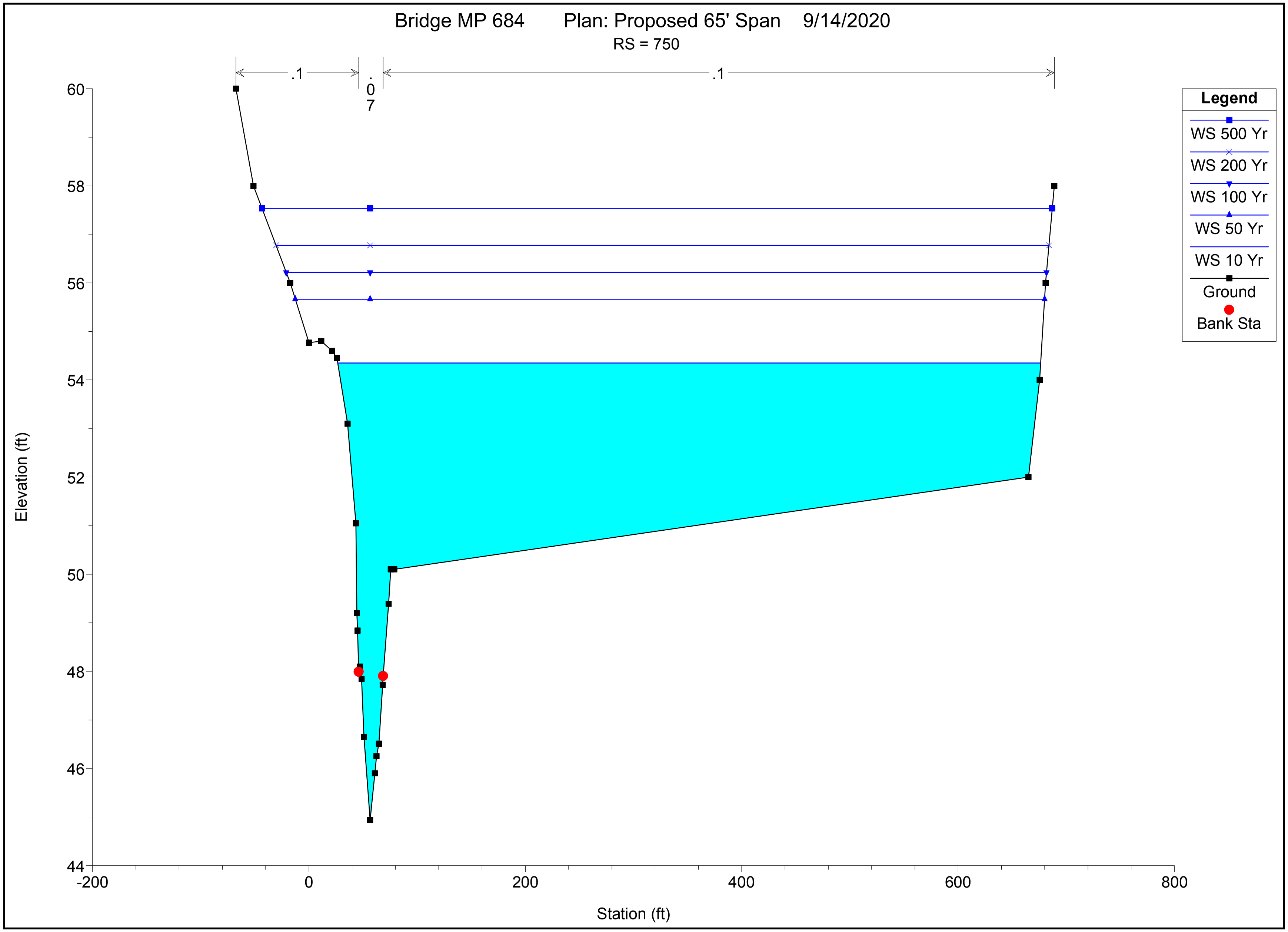

Bridge MP 684 Plan: Proposed 65' Span 9/14/2020

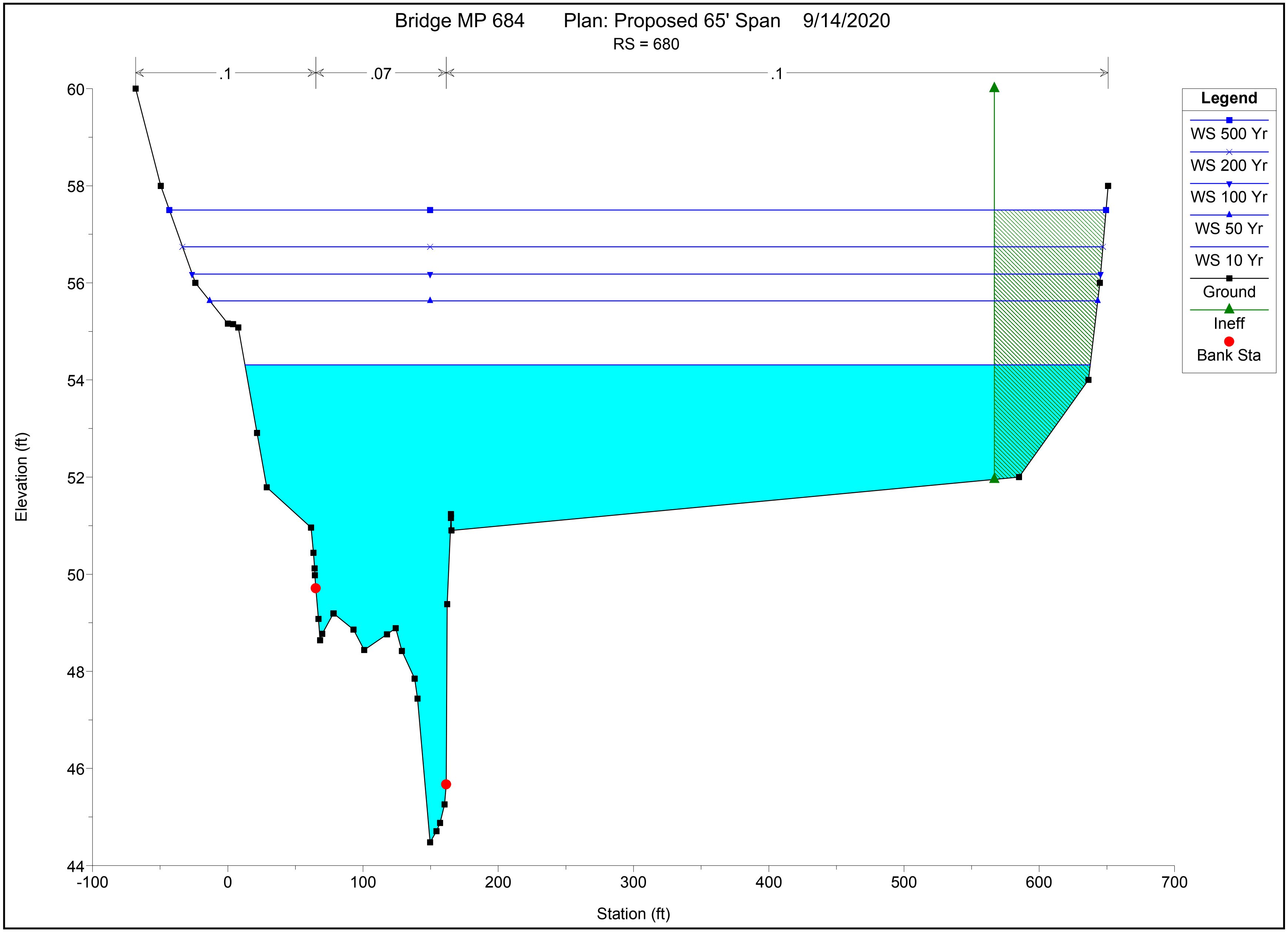


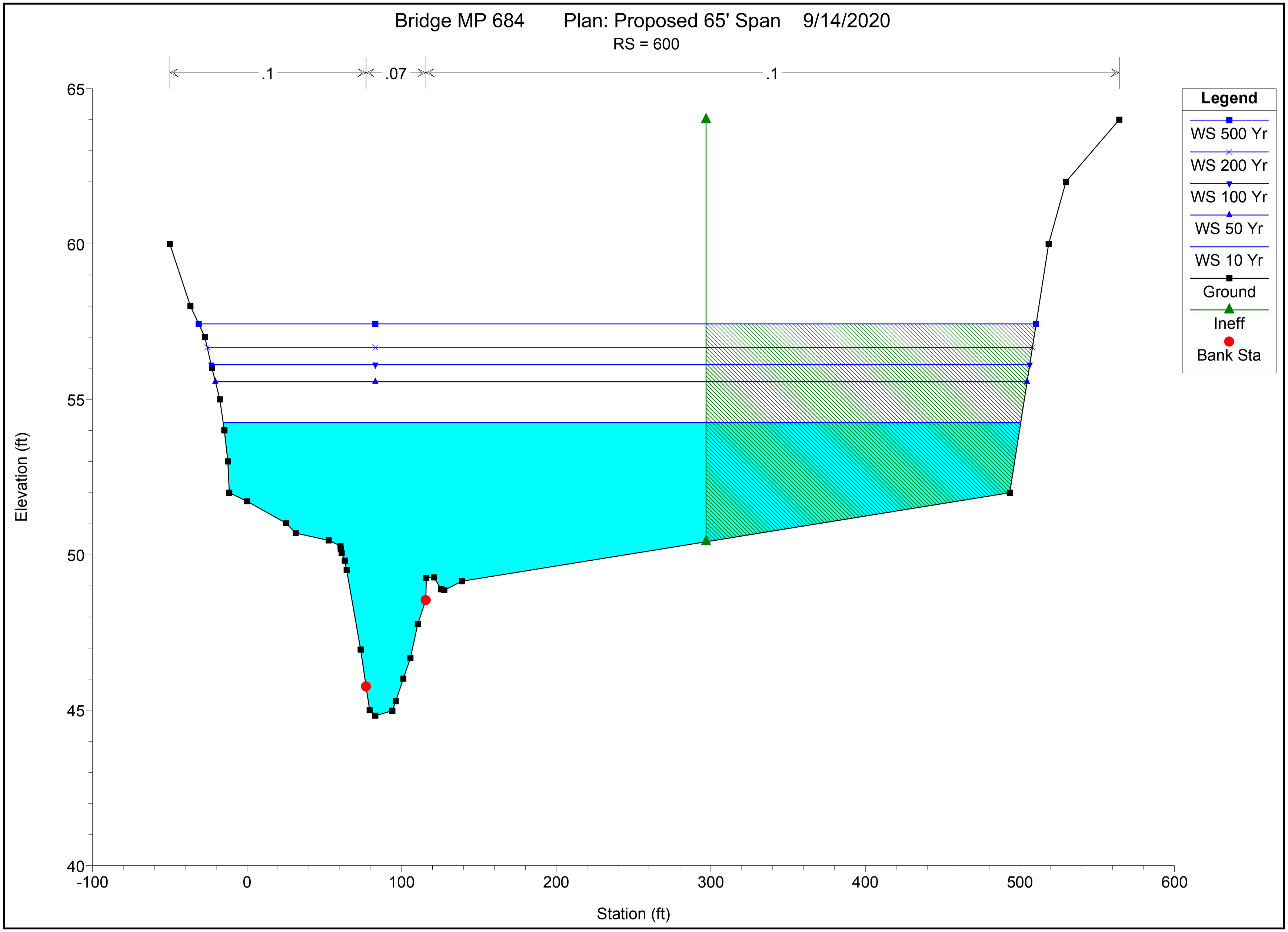
Bridge MP 684 Plan: Proposed 65' Span 9/14/2020

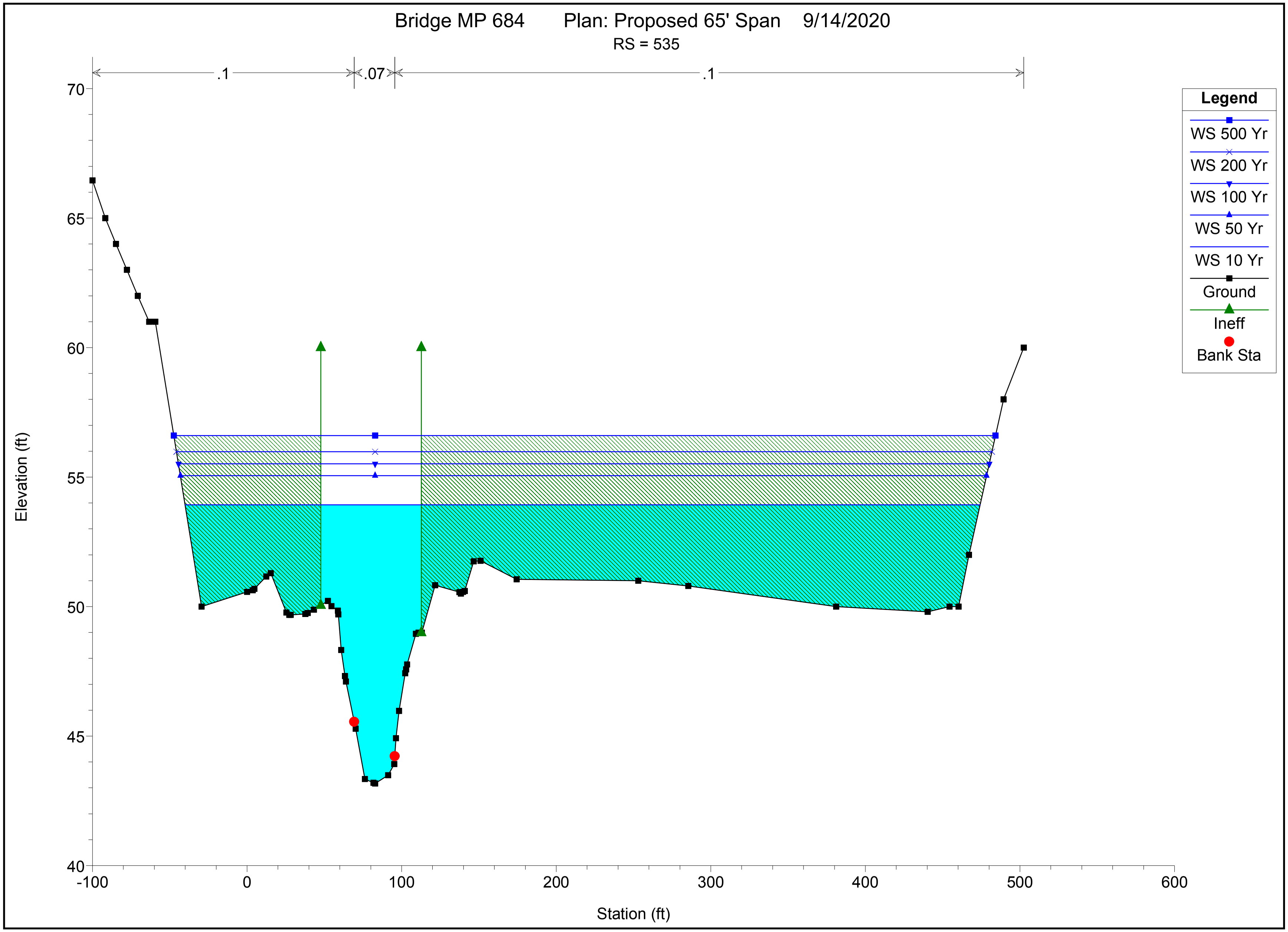
RS = 1050


Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 880
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
62
60
58
56
54
52
50
48
46
44
-200
0
200
400
600
800
Station (ft)


Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 750
.1
.
0
7
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
60
58
56
54
52
50
48
46
44
-200
0
200
400
600
800
Station (ft)

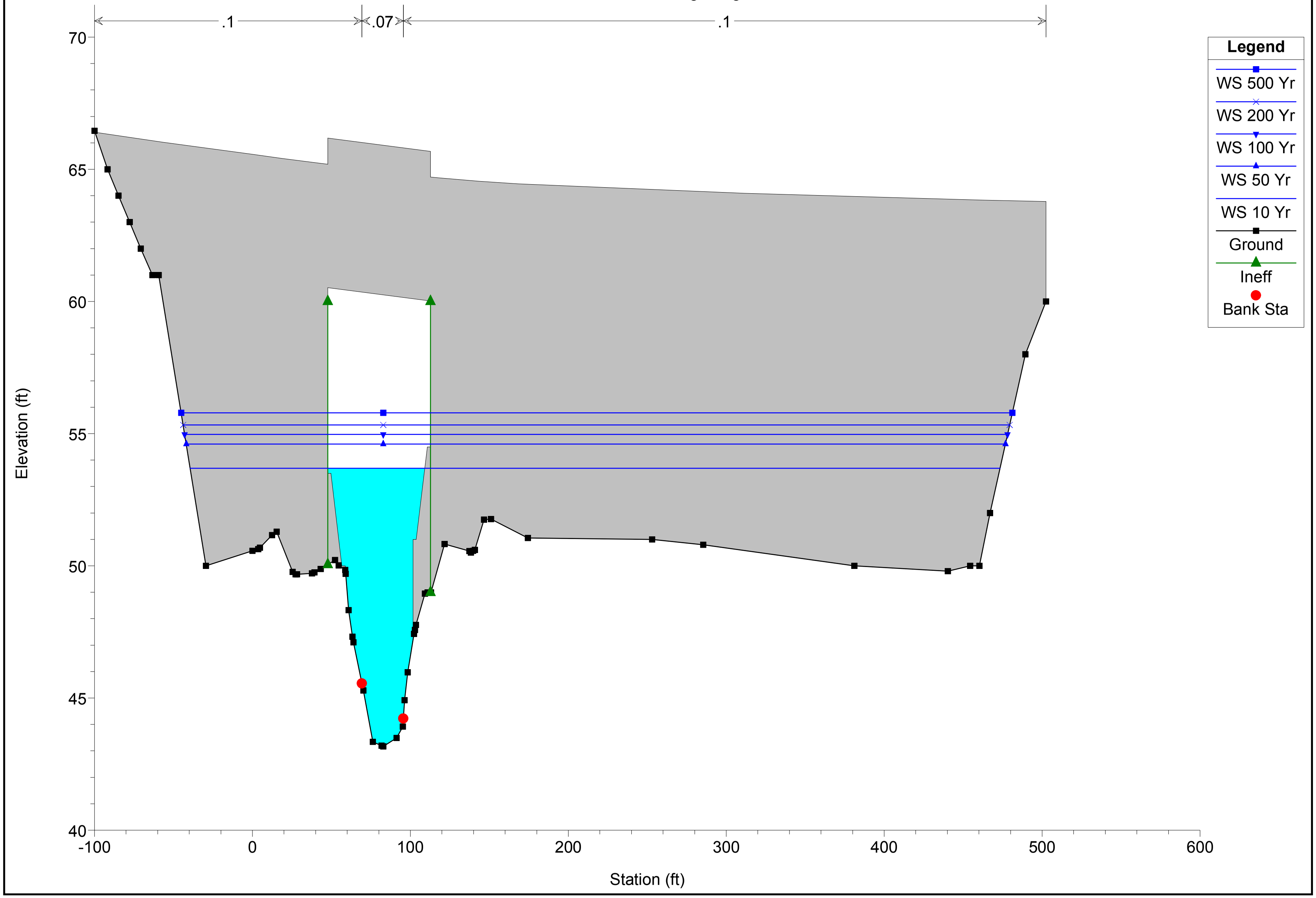

Bridge MP 684       Plan: Proposed 65' Span    9/14/2020
RS = 680

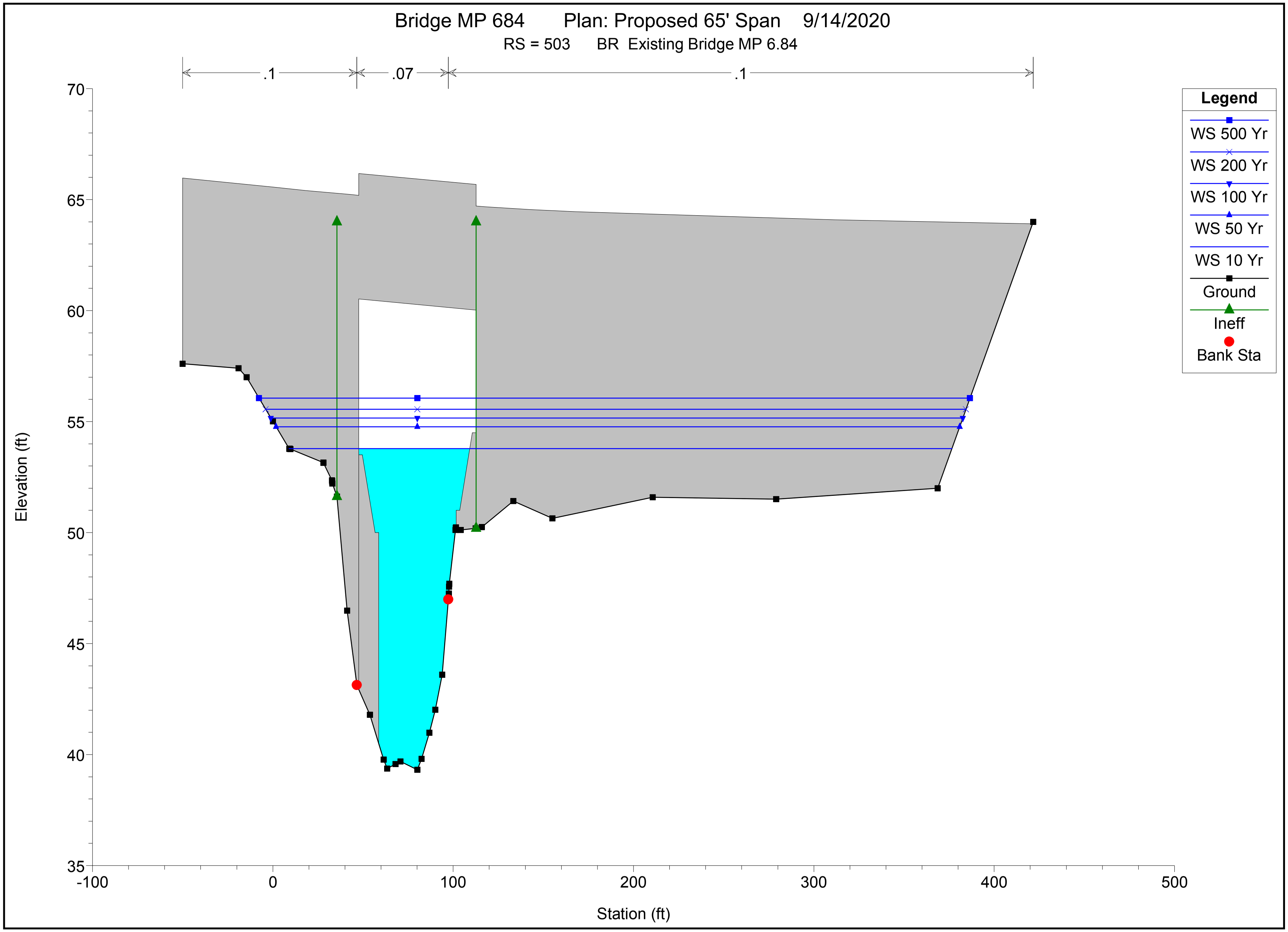

Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 600
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
65
60
55
50
45
40
Station (ft)
-100
0
100
200
300
400
500
600


Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 535
.1
.07
.1
Elevation (ft)
40
45
50
55
60
65
70
Station (ft)
-100
0
100
200
300
400
500
600
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Ineff
Bank Sta

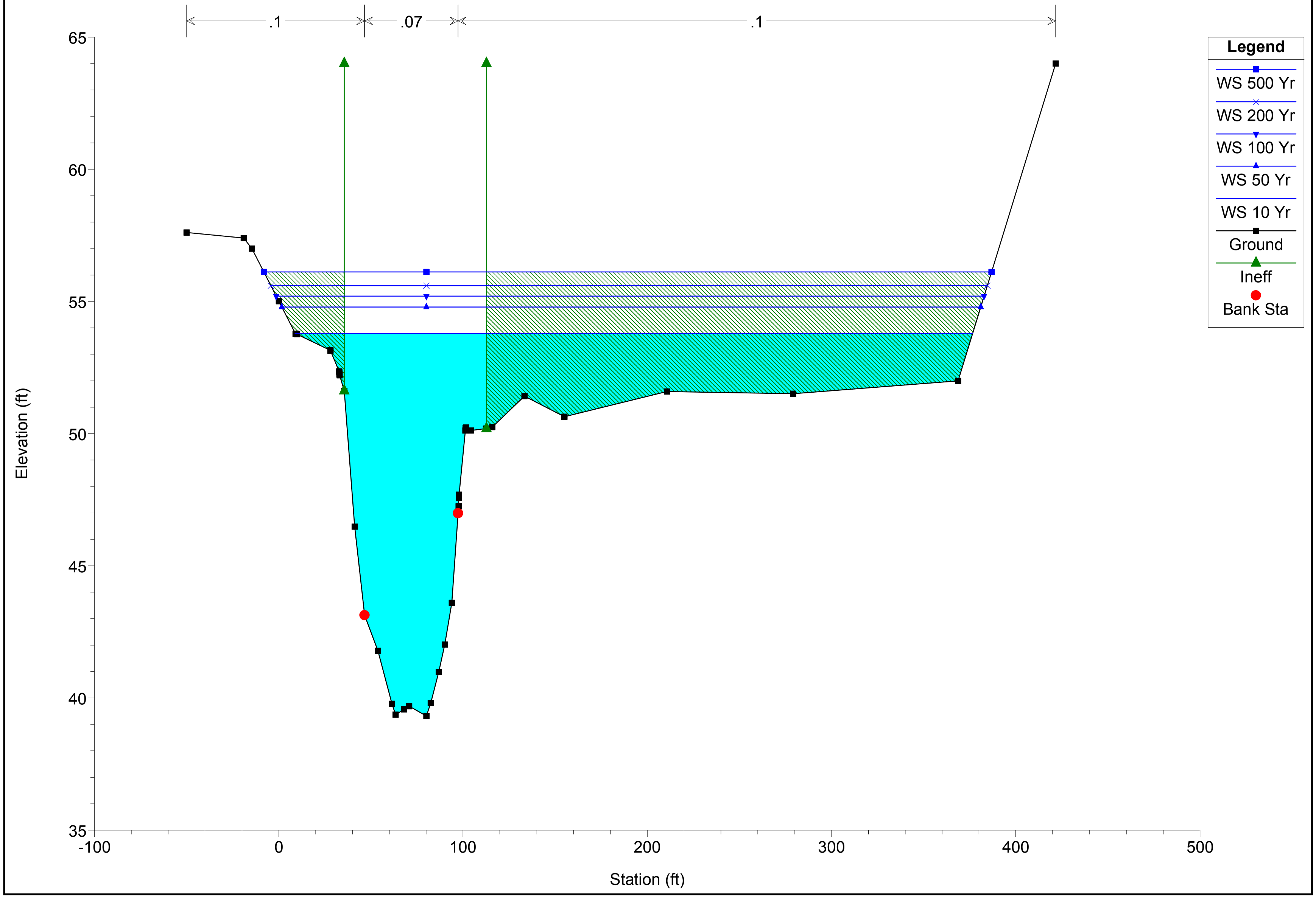
Bridge MP 684 Plan: Proposed 65' Span 9/14/2020

RS = 503 BR Existing Bridge MP 6.84



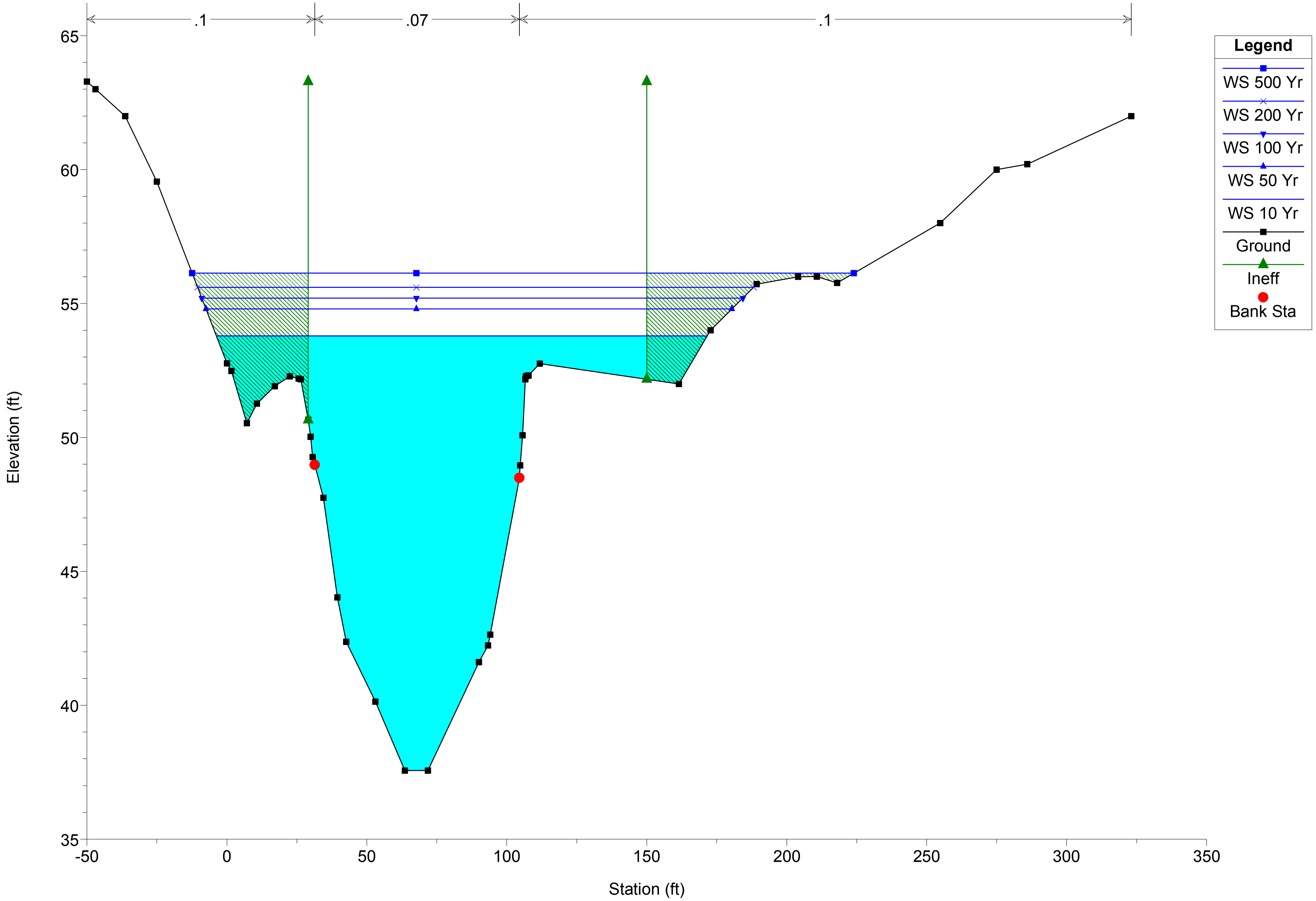

Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 503 BR Existing Bridge MP 6.84
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
70
65
60
55
50
45
40
35
-100
0
100
200
300
400
500
Station (ft)

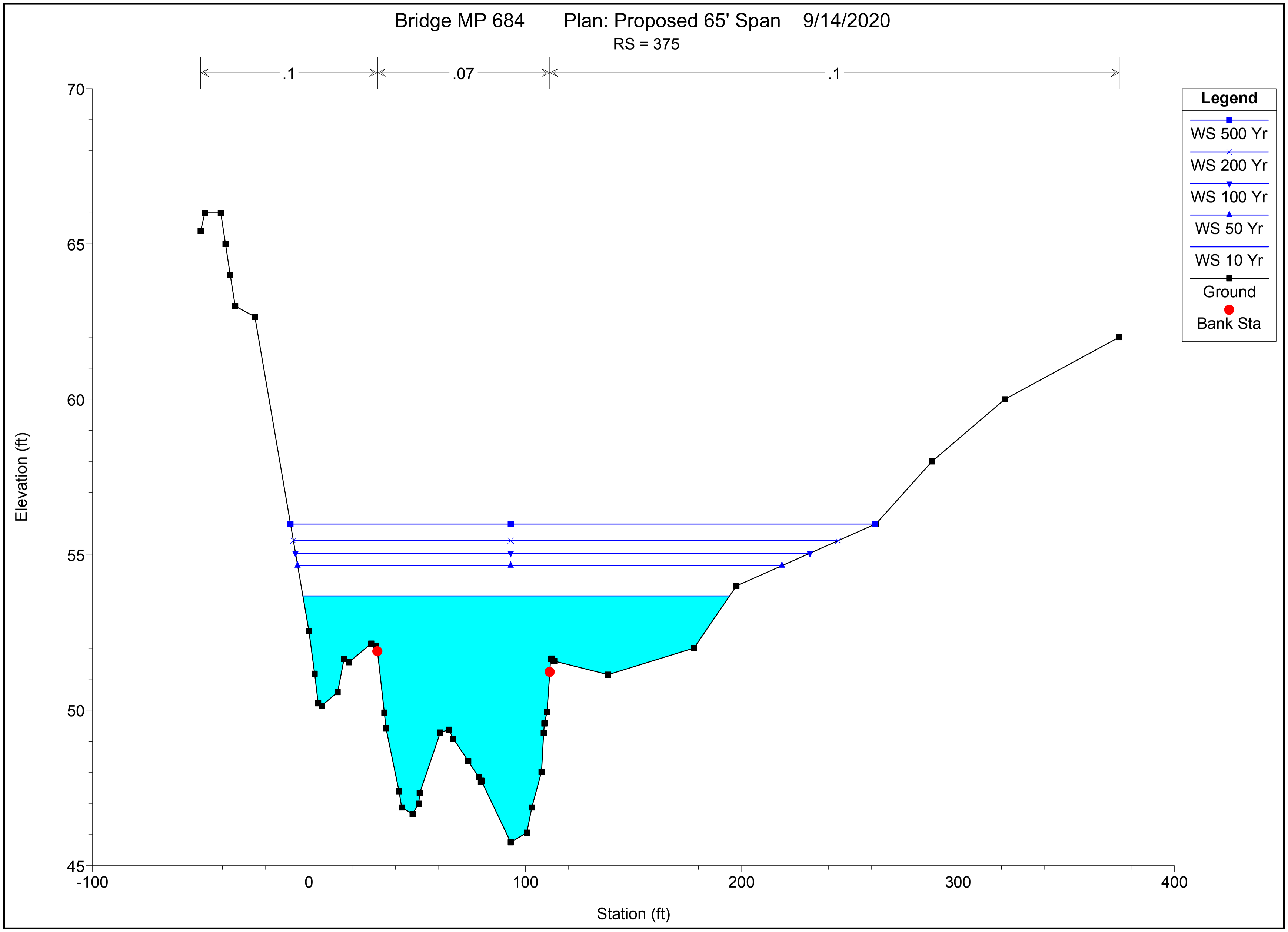
Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 470

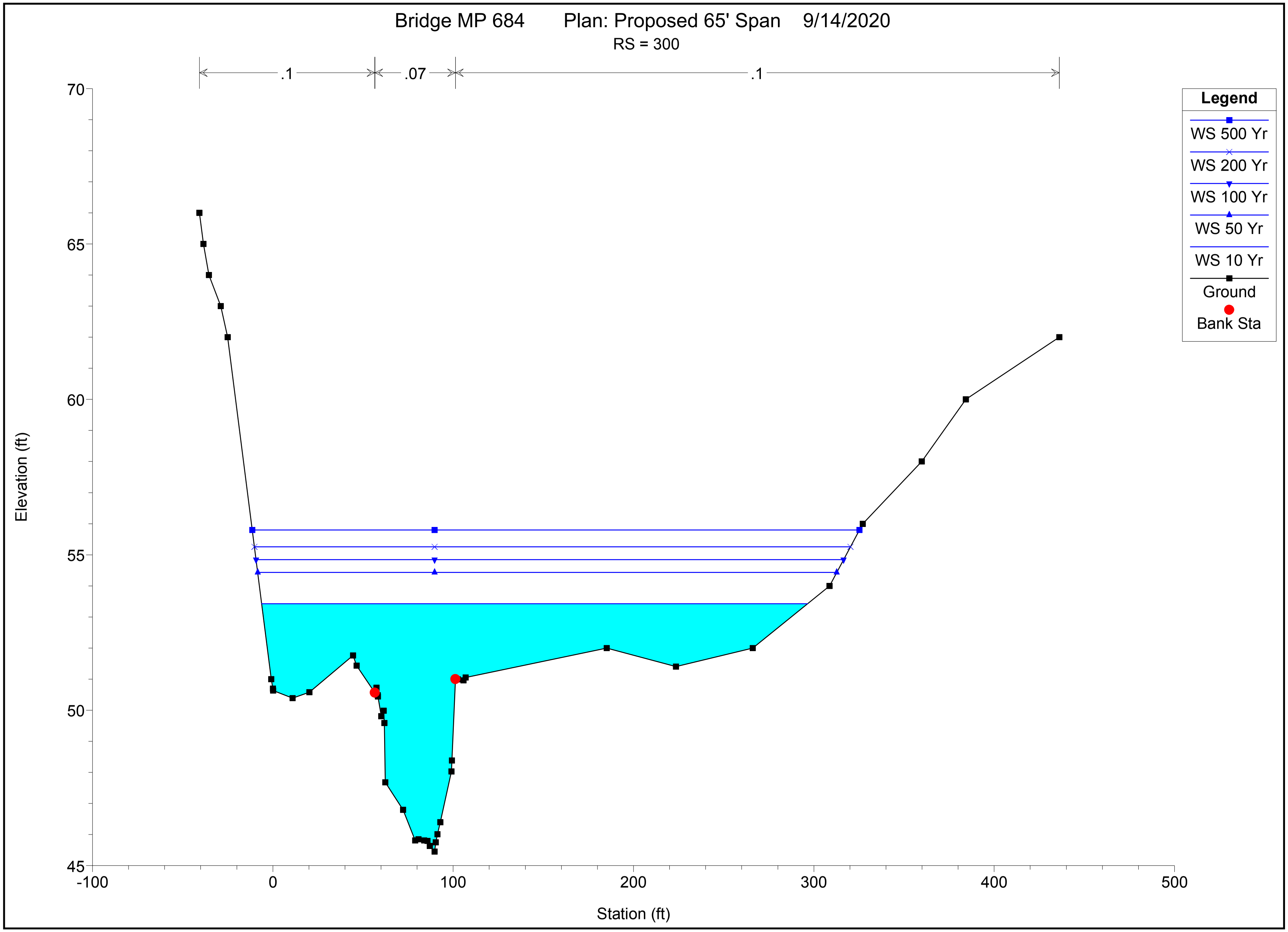


Bridge MP 684 Plan: Proposed 65' Span 9/14/2020

RS = 425

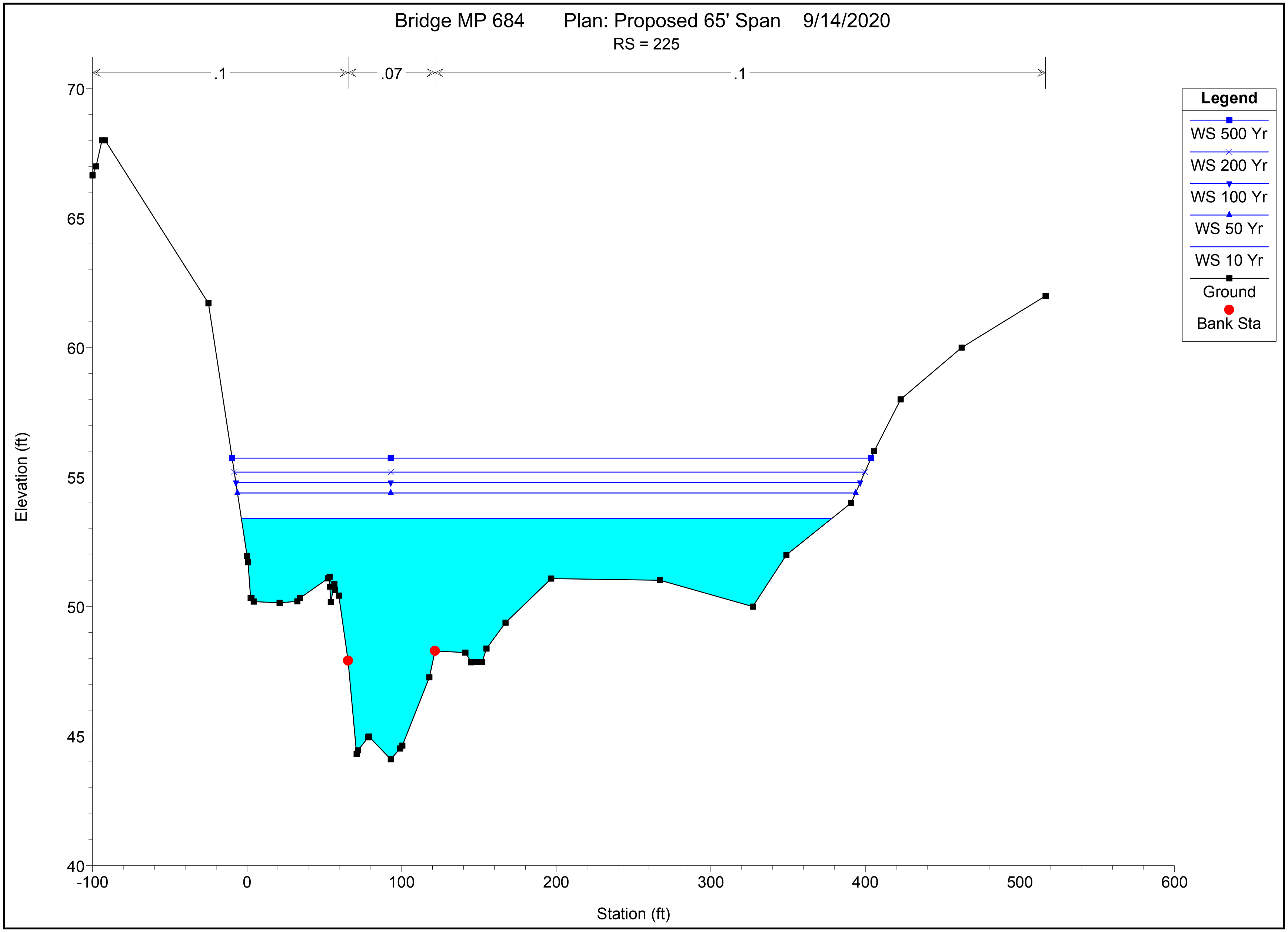


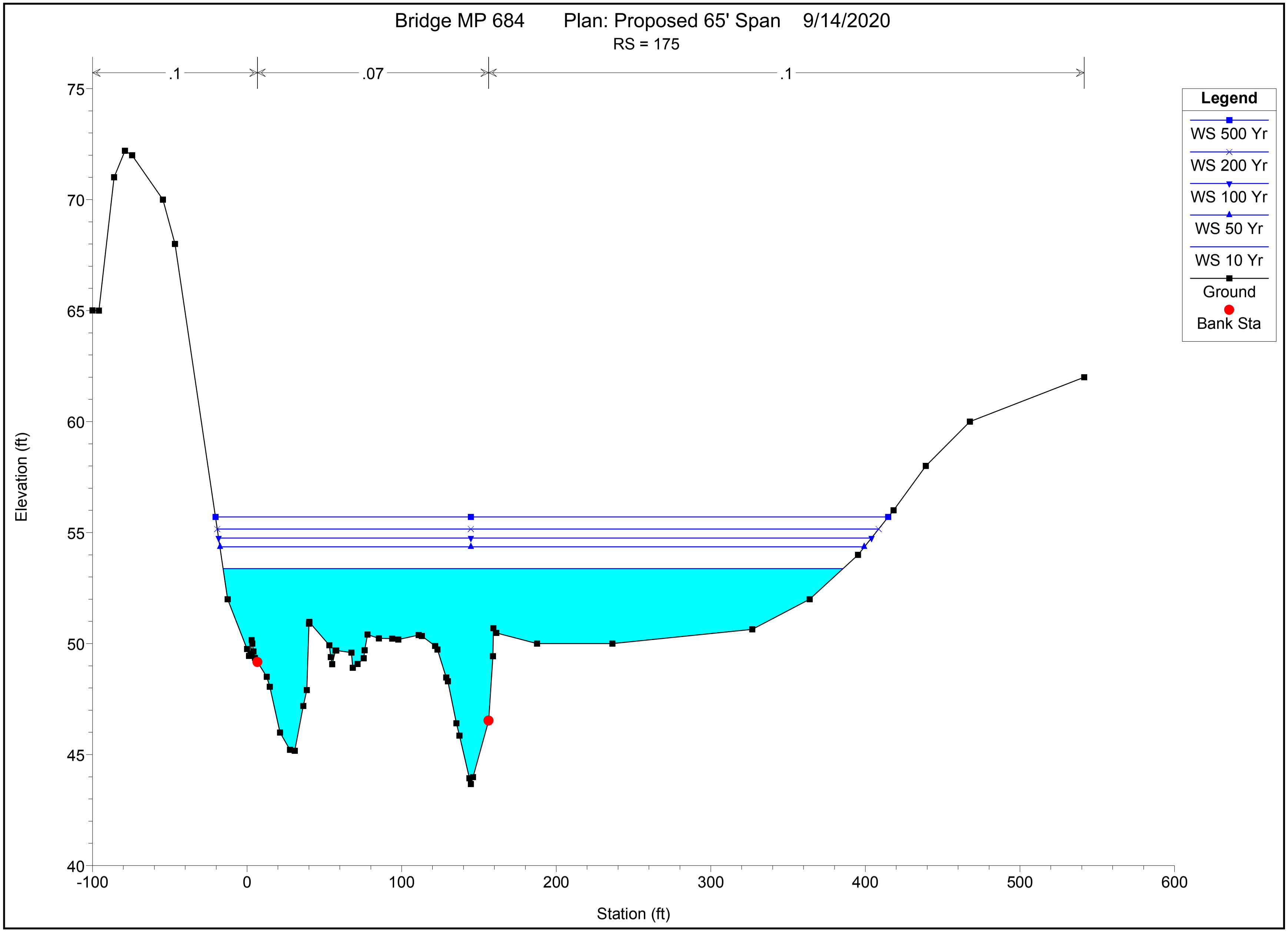

Bridge MP 684
Plan: Proposed 65' Span
9/14/2020
RS = 375
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
70
65
60
55
50
45
-100
0
100
200
300
400
Station (ft)

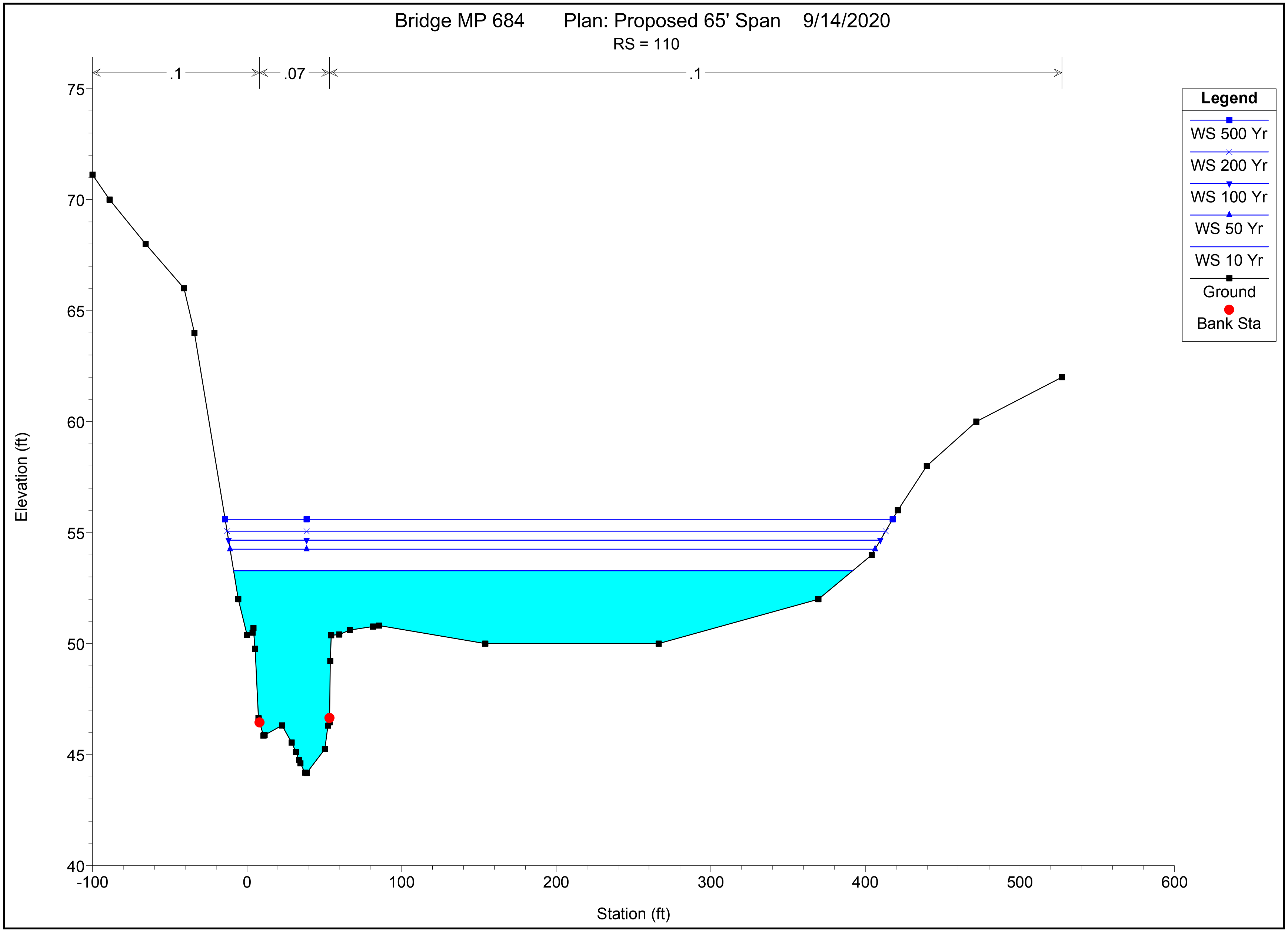


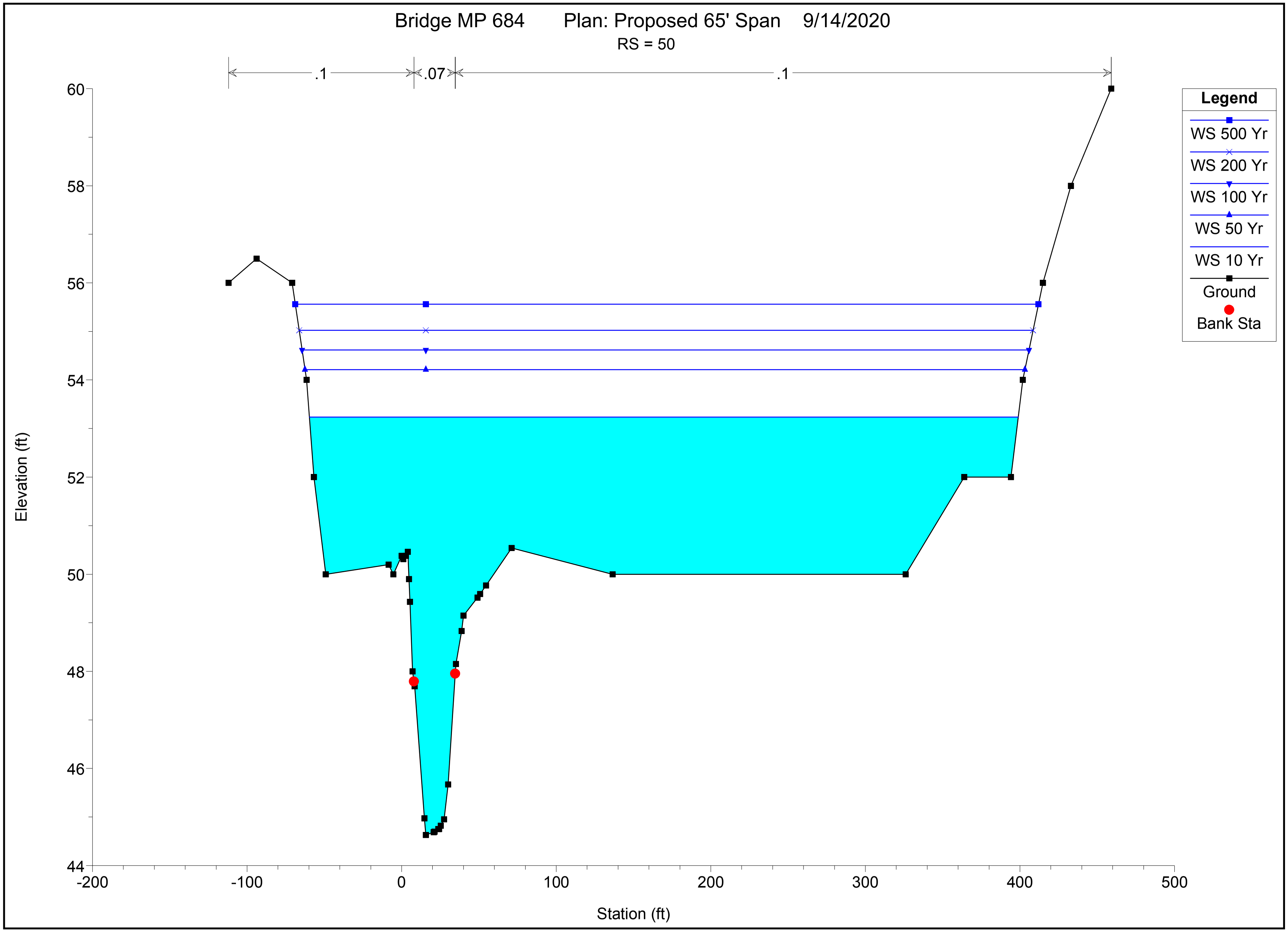
Bridge MP 684 Plan: Proposed 65' Span 9/14/2020

RS = 300


Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 225
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
70
65
60
55
50
45
40
Station (ft)
-100
0
100
200
300
400
500
600


Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 175
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
75
70
65
60
55
50
45
40
-100
0
100
200
300
400
500
600
Station (ft)


Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 110
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
75
70
65
60
55
50
45
40
-100
0
100
200
300
400
500
600
Station (ft)


Bridge MP 684 Plan: Proposed 65' Span 9/14/2020
RS = 50
.1
.07
.1
Legend
WS 500 Yr
WS 200 Yr
WS 100 Yr
WS 50 Yr
WS 10 Yr
Ground
Bank Sta
Elevation (ft)
60
58
56
54
52
50
48
46
44
Station (ft)
-200
-100
0
100
200
300
400
500

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 1050    Profile: 10 Yr

| E.G. Elev (ft) | 54.47 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.44 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 45.74 | 333.37 | 1510.91 |
| E.G. Slope (ft/ft) | 0.000585 | Area (sq ft) | 45.74 | 333.37 | 1510.91 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 29.99 | 659.49 | 1039.51 |
| Top Width (ft) | 631.15 | Top Width (ft) | 17.76 | 43.26 | 570.13 |
| Vel Total (ft/s) | 0.91 | Avg. Vel. (ft/s) | 0.66 | 1.98 | 0.69 |
| Max Chl Dpth (ft) | 9.06 | Hydr. Depth (ft) | 2.58 | 7.71 | 2.65 |
| Conv. Total (cfs) | 71455.9 | Conv. (cfs) | 1239.5 | 27255.5 | 42960.8 |
| Length Wtd. (ft) | 167.39 | Wetted Per. (ft) | 18.58 | 44.10 | 570.79 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.09 | 0.28 | 0.10 |
| Alpha | 2.13 | Stream Power (lb/ft s) | 0.06 | 0.55 | 0.07 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 4.08 | 11.53 | 27.30 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 1.37 | 1.76 | 9.10 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 1050    Profile: 50 Yr

| E.G. Elev (ft) | 55.77 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.74 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 90.90 | 389.63 | 2254.40 |
| E.G. Slope (ft/ft) | 0.000457 | Area (sq ft) | 90.90 | 389.63 | 2254.40 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 37.47 | 755.45 | 1782.08 |
| Top Width (ft) | 702.10 | Top Width (ft) | 85.67 | 43.26 | 573.17 |
| Vel Total (ft/s) | 0.94 | Avg. Vel. (ft/s) | 0.41 | 1.94 | 0.79 |
| Max Chl Dpth (ft) | 10.36 | Hydr. Depth (ft) | 1.06 | 9.01 | 3.93 |
| Conv. Total (cfs) | 120478.2 | Conv. (cfs) | 1753.2 | 35345.9 | 83379.1 |
| Length Wtd. (ft) | 166.62 | Wetted Per. (ft) | 86.62 | 44.10 | 574.10 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.03 | 0.25 | 0.11 |
| Alpha | 1.73 | Stream Power (lb/ft s) | 0.01 | 0.49 | 0.09 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 5.97 | 13.60 | 38.38 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.96 | 1.76 | 9.34 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 1050    Profile: 100 Yr

| E.G. Elev (ft) | 56.31 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.29 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 166.95 | 413.28 | 2568.11 |
| E.G. Slope (ft/ft) | 0.000419 | Area (sq ft) | 166.95 | 413.28 | 2568.11 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 50.00 | 797.79 | 2116.21 |
| Top Width (ft) | 787.49 | Top Width (ft) | 169.78 | 43.26 | 574.44 |
| Vel Total (ft/s) | 0.94 | Avg. Vel. (ft/s) | 0.30 | 1.93 | 0.82 |
| Max Chl Dpth (ft) | 10.91 | Hydr. Depth (ft) | 0.98 | 9.55 | 4.47 |
| Conv. Total (cfs) | 144870.9 | Conv. (cfs) | 2443.6 | 38993.6 | 103433.7 |
| Length Wtd. (ft) | 166.73 | Wetted Per. (ft) | 170.76 | 44.10 | 575.48 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.03 | 0.24 | 0.12 |
| Alpha | 1.68 | Stream Power (lb/ft s) | 0.01 | 0.47 | 0.10 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 7.10 | 14.47 | 43.07 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 2.38 | 1.76 | 9.43 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 1050    Profile: 200 Yr

| E.G. Elev (ft) | 56.87 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.85 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 262.56 | 437.37 | 2888.28 |
| E.G. Slope (ft/ft) | 0.000379 | Area (sq ft) | 262.56 | 437.37 | 2888.28 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 99.58 | 833.75 | 2443.66 |
| Top Width (ft) | 792.71 | Top Width (ft) | 173.71 | 43.26 | 575.74 |
| Vel Total (ft/s) | 0.94 | Avg. Vel. (ft/s) | 0.38 | 1.91 | 0.85 |
| Max Chl Dpth (ft) | 11.47 | Hydr. Depth (ft) | 1.51 | 10.11 | 5.02 |
| Conv. Total (cfs) | 173573.9 | Conv. (cfs) | 5118.5 | 42854.0 | 125601.5 |
| Length Wtd. (ft) | 167.57 | Wetted Per. (ft) | 174.73 | 44.10 | 576.90 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.04 | 0.23 | 0.12 |
| Alpha | 1.60 | Stream Power (lb/ft s) | 0.01 | 0.45 | 0.10 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 8.36 | 15.34 | 47.87 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 2.49 | 1.76 | 9.51 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 1050    Profile: 500 Yr

| E.G. Elev (ft) | 57.62 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.60 | Reach Len. (ft) | 292.54 | 170.00 | 161.74 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 395.36 | 469.94 | 3322.46 |
| E.G. Slope (ft/ft) | 0.000335 | Area (sq ft) | 395.36 | 469.94 | 3322.46 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 181.60 | 883.98 | 2896.42 |
| Top Width (ft) | 799.77 | Top Width (ft) | 179.02 | 43.26 | 577.50 |
| Vel Total (ft/s) | 0.95 | Avg. Vel. (ft/s) | 0.46 | 1.88 | 0.87 |
| Max Chl Dpth (ft) | 12.22 | Hydr. Depth (ft) | 2.21 | 10.86 | 5.75 |
| Conv. Total (cfs) | 216500.3 | Conv. (cfs) | 9923.4 | 48304.4 | 158272.6 |
| Length Wtd. (ft) | 168.68 | Wetted Per. (ft) | 180.09 | 44.10 | 578.81 |
| Min Ch El (ft) | 45.38 | Shear (lb/sq ft) | 0.05 | 0.22 | 0.12 |
| Alpha | 1.51 | Stream Power (lb/ft s) | 0.02 | 0.42 | 0.10 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 10.16 | 16.51 | 54.37 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 2.66 | 1.76 | 9.68 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 880    Profile: 10 Yr

| E.G. Elev (ft) | 54.41 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.40 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 57.68 | 961.60 | 1732.26 |
| E.G. Slope (ft/ft) | 0.000204 | Area (sq ft) | 57.68 | 961.60 | 1732.26 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 24.33 | 847.44 | 857.23 |
| Top Width (ft) | 695.79 | Top Width (ft) | 19.84 | 191.90 | 484.05 |
| Vel Total (ft/s) | 0.63 | Avg. Vel. (ft/s) | 0.42 | 0.88 | 0.49 |
| Max Chl Dpth (ft) | 9.19 | Hydr. Depth (ft) | 2.91 | 5.01 | 3.58 |
| Conv. Total (cfs) | 121183.0 | Conv. (cfs) | 1704.9 | 59395.9 | 60082.3 |
| Length Wtd. (ft) | 153.96 | Wetted Per. (ft) | 20.56 | 193.73 | 485.74 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.04 | 0.06 | 0.05 |
| Alpha | 1.28 | Stream Power (lb/ft s) | 0.02 | 0.06 | 0.02 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 3.73 | 9.01 | 21.28 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.24 | 1.30 | 7.14 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 880    Profile: 50 Yr

| E.G. Elev (ft) | 55.72 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.71 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 92.90 | 1212.01 | 2366.45 |
| E.G. Slope (ft/ft) | 0.000183 | Area (sq ft) | 92.90 | 1212.01 | 2366.45 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 32.21 | 1182.50 | 1360.28 |
| Top Width (ft) | 720.09 | Top Width (ft) | 40.23 | 191.90 | 487.96 |
| Vel Total (ft/s) | 0.70 | Avg. Vel. (ft/s) | 0.35 | 0.98 | 0.57 |
| Max Chl Dpth (ft) | 10.50 | Hydr. Depth (ft) | 2.31 | 6.32 | 4.85 |
| Conv. Total (cfs) | 190217.5 | Conv. (cfs) | 2379.5 | 87352.7 | 100485.4 |
| Length Wtd. (ft) | 155.25 | Wetted Per. (ft) | 41.05 | 193.73 | 489.87 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.03 | 0.07 | 0.06 |
| Alpha | 1.25 | Stream Power (lb/ft s) | 0.01 | 0.07 | 0.03 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 5.36 | 10.48 | 29.80 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.54 | 1.30 | 7.37 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 880    Profile: 100 Yr

| E.G. Elev (ft) | 56.27 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.26 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 117.14 | 1317.22 | 2634.44 |
| E.G. Slope (ft/ft) | 0.000176 | Area (sq ft) | 117.14 | 1317.22 | 2634.44 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 41.84 | 1331.56 | 1590.60 |
| Top Width (ft) | 728.72 | Top Width (ft) | 47.21 | 191.90 | 489.61 |
| Vel Total (ft/s) | 0.73 | Avg. Vel. (ft/s) | 0.36 | 1.01 | 0.60 |
| Max Chl Dpth (ft) | 11.05 | Hydr. Depth (ft) | 2.48 | 6.86 | 5.38 |
| Conv. Total (cfs) | 223382.7 | Conv. (cfs) | 3152.9 | 100353.6 | 119876.2 |
| Length Wtd. (ft) | 155.58 | Wetted Per. (ft) | 48.05 | 193.73 | 491.60 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.03 | 0.07 | 0.06 |
| Alpha | 1.24 | Stream Power (lb/ft s) | 0.01 | 0.08 | 0.04 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 6.15 | 11.09 | 33.42 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.65 | 1.30 | 7.45 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 880    Profile: 200 Yr

| E.G. Elev (ft) | 56.82 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.81 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 144.85 | 1424.30 | 2908.09 |
| E.G. Slope (ft/ft) | 0.000169 | Area (sq ft) | 144.85 | 1424.30 | 2908.09 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 54.75 | 1487.49 | 1834.76 |
| Top Width (ft) | 735.30 | Top Width (ft) | 52.12 | 191.90 | 491.28 |
| Vel Total (ft/s) | 0.75 | Avg. Vel. (ft/s) | 0.38 | 1.04 | 0.63 |
| Max Chl Dpth (ft) | 11.60 | Hydr. Depth (ft) | 2.78 | 7.42 | 5.92 |
| Conv. Total (cfs) | 259525.0 | Conv. (cfs) | 4207.8 | 114314.4 | 141002.8 |
| Length Wtd. (ft) | 155.84 | Wetted Per. (ft) | 52.99 | 193.73 | 493.37 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.03 | 0.08 | 0.06 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.01 | 0.08 | 0.04 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 6.99 | 11.71 | 37.11 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.73 | 1.30 | 7.53 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 880    Profile: 500 Yr

| E.G. Elev (ft) | 57.58 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.57 | Reach Len. (ft) | 147.89 | 130.00 | 166.39 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 186.68 | 1569.09 | 3279.61 |
| E.G. Slope (ft/ft) | 0.000161 | Area (sq ft) | 186.68 | 1569.09 | 3279.61 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 75.35 | 1705.85 | 2180.81 |
| Top Width (ft) | 744.20 | Top Width (ft) | 58.76 | 191.90 | 493.54 |
| Vel Total (ft/s) | 0.79 | Avg. Vel. (ft/s) | 0.40 | 1.09 | 0.66 |
| Max Chl Dpth (ft) | 12.36 | Hydr. Depth (ft) | 3.18 | 8.18 | 6.65 |
| Conv. Total (cfs) | 311998.8 | Conv. (cfs) | 5933.3 | 134331.6 | 171733.9 |
| Length Wtd. (ft) | 156.12 | Wetted Per. (ft) | 59.68 | 193.73 | 495.75 |
| Min Ch El (ft) | 45.21 | Shear (lb/sq ft) | 0.03 | 0.08 | 0.07 |
| Alpha | 1.22 | Stream Power (lb/ft s) | 0.01 | 0.09 | 0.04 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 8.21 | 12.53 | 42.11 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.86 | 1.30 | 7.69 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 750    Profile: 10 Yr

| E.G. Elev (ft) | 54.36 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.35 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 36.56 | 179.40 | 1999.62 |
| E.G. Slope (ft/ft) | 0.000454 | Area (sq ft) | 36.56 | 179.40 | 1999.62 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 16.67 | 312.65 | 1399.69 |
| Top Width (ft) | 649.59 | Top Width (ft) | 19.30 | 22.72 | 607.57 |
| Vel Total (ft/s) | 0.78 | Avg. Vel. (ft/s) | 0.46 | 1.74 | 0.70 |
| Max Chl Dpth (ft) | 9.41 | Hydr. Depth (ft) | 1.89 | 7.90 | 3.29 |
| Conv. Total (cfs) | 81156.2 | Conv. (cfs) | 782.5 | 14675.0 | 65698.8 |
| Length Wtd. (ft) | 70.81 | Wetted Per. (ft) | 21.16 | 23.71 | 608.17 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.05 | 0.21 | 0.09 |
| Alpha | 1.56 | Stream Power (lb/ft s) | 0.02 | 0.37 | 0.07 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 3.57 | 7.30 | 14.15 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.17 | 0.98 | 5.05 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 750    Profile: 50 Yr

| E.G. Elev (ft) | 55.68 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.66 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 93.25 | 209.23 | 2799.90 |
| E.G. Slope (ft/ft) | 0.000361 | Area (sq ft) | 93.25 | 209.23 | 2799.90 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 35.16 | 360.50 | 2179.34 |
| Top Width (ft) | 692.52 | Top Width (ft) | 58.55 | 22.72 | 611.25 |
| Vel Total (ft/s) | 0.83 | Avg. Vel. (ft/s) | 0.38 | 1.72 | 0.78 |
| Max Chl Dpth (ft) | 10.72 | Hydr. Depth (ft) | 1.59 | 9.21 | 4.58 |
| Conv. Total (cfs) | 135460.6 | Conv. (cfs) | 1849.8 | 18964.3 | 114646.5 |
| Length Wtd. (ft) | 70.96 | Wetted Per. (ft) | 60.45 | 23.71 | 612.08 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.03 | 0.20 | 0.10 |
| Alpha | 1.35 | Stream Power (lb/ft s) | 0.01 | 0.34 | 0.08 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 5.04 | 8.36 | 19.94 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.37 | 0.98 | 5.27 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 750    Profile: 100 Yr

| E.G. Elev (ft) | 56.23 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.21 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 127.70 | 221.75 | 3137.07 |
| E.G. Slope (ft/ft) | 0.000335 | Area (sq ft) | 127.70 | 221.75 | 3137.07 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 52.40 | 382.16 | 2529.44 |
| Top Width (ft) | 702.68 | Top Width (ft) | 66.92 | 22.72 | 613.05 |
| Vel Total (ft/s) | 0.85 | Avg. Vel. (ft/s) | 0.41 | 1.72 | 0.81 |
| Max Chl Dpth (ft) | 11.27 | Hydr. Depth (ft) | 1.91 | 9.76 | 5.12 |
| Conv. Total (cfs) | 162042.1 | Conv. (cfs) | 2864.9 | 20892.5 | 138284.8 |
| Length Wtd. (ft) | 71.16 | Wetted Per. (ft) | 68.84 | 23.71 | 613.96 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.04 | 0.20 | 0.11 |
| Alpha | 1.30 | Stream Power (lb/ft s) | 0.02 | 0.34 | 0.09 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 5.73 | 8.79 | 22.39 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.45 | 0.98 | 5.34 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 750    Profile: 200 Yr

| E.G. Elev (ft) | 56.79 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.01 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.77 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 167.85 | 234.48 | 3481.12 |
| E.G. Slope (ft/ft) | 0.000312 | Area (sq ft) | 167.85 | 234.48 | 3481.12 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 73.23 | 405.11 | 2898.66 |
| Top Width (ft) | 714.42 | Top Width (ft) | 76.41 | 22.72 | 615.29 |
| Vel Total (ft/s) | 0.87 | Avg. Vel. (ft/s) | 0.44 | 1.73 | 0.83 |
| Max Chl Dpth (ft) | 11.83 | Hydr. Depth (ft) | 2.20 | 10.32 | 5.66 |
| Conv. Total (cfs) | 191137.7 | Conv. (cfs) | 4144.8 | 22929.1 | 164063.8 |
| Length Wtd. (ft) | 71.44 | Wetted Per. (ft) | 78.35 | 23.71 | 616.27 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.04 | 0.19 | 0.11 |
| Alpha | 1.27 | Stream Power (lb/ft s) | 0.02 | 0.33 | 0.09 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 6.46 | 9.23 | 24.90 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.52 | 0.98 | 5.42 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 750    Profile: 500 Yr

| E.G. Elev (ft) | 57.55 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.53 | Reach Len. (ft) | 131.29 | 70.00 | 68.72 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 230.56 | 251.68 | 3948.10 |
| E.G. Slope (ft/ft) | 0.000287 | Area (sq ft) | 230.56 | 251.68 | 3948.10 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 107.72 | 437.15 | 3417.14 |
| Top Width (ft) | 730.28 | Top Width (ft) | 89.24 | 22.72 | 618.31 |
| Vel Total (ft/s) | 0.89 | Avg. Vel. (ft/s) | 0.47 | 1.74 | 0.87 |
| Max Chl Dpth (ft) | 12.59 | Hydr. Depth (ft) | 2.58 | 11.08 | 6.39 |
| Conv. Total (cfs) | 233838.7 | Conv. (cfs) | 6357.5 | 25800.6 | 201680.6 |
| Length Wtd. (ft) | 71.80 | Wetted Per. (ft) | 91.20 | 23.71 | 619.39 |
| Min Ch El (ft) | 44.94 | Shear (lb/sq ft) | 0.05 | 0.19 | 0.11 |
| Alpha | 1.23 | Stream Power (lb/ft s) | 0.02 | 0.33 | 0.10 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 7.50 | 9.81 | 28.31 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.61 | 0.98 | 5.56 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 680 Profile: 10 Yr

| E.G. Elev (ft) | 54.33 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.31 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 130.52 | 612.40 | 1174.98 |
| E.G. Slope (ft/ft) | 0.000432 | Area (sq ft) | 130.52 | 612.40 | 1285.30 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 73.59 | 921.82 | 733.59 |
| Top Width (ft) | 625.06 | Top Width (ft) | 52.50 | 96.38 | 476.19 |
| Vel Total (ft/s) | 0.90 | Avg. Vel. (ft/s) | 0.56 | 1.51 | 0.62 |
| Max Chl Dpth (ft) | 9.83 | Hydr. Depth (ft) | 2.49 | 6.35 | 2.90 |
| Conv. Total (cfs) | 83157.9 | Conv. (cfs) | 3539.5 | 44335.8 | 35282.6 |
| Length Wtd. (ft) | 88.82 | Wetted Per. (ft) | 52.94 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.07 | 0.17 | 0.08 |
| Alpha | 1.71 | Stream Power (lb/ft s) | 0.04 | 0.26 | 0.05 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 3.32 | 6.67 | 11.56 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.07 | 0.89 | 4.20 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 680 Profile: 50 Yr

| E.G. Elev (ft) | 55.65 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.63 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 211.17 | 739.33 | 1708.56 |
| E.G. Slope (ft/ft) | 0.000377 | Area (sq ft) | 211.17 | 739.33 | 1916.02 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 117.37 | 1178.66 | 1278.98 |
| Top Width (ft) | 656.60 | Top Width (ft) | 78.51 | 96.38 | 481.72 |
| Vel Total (ft/s) | 0.97 | Avg. Vel. (ft/s) | 0.56 | 1.59 | 0.75 |
| Max Chl Dpth (ft) | 11.15 | Hydr. Depth (ft) | 2.69 | 7.67 | 4.22 |
| Conv. Total (cfs) | 132578.8 | Conv. (cfs) | 6043.0 | 60685.4 | 65850.5 |
| Length Wtd. (ft) | 89.85 | Wetted Per. (ft) | 79.02 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.06 | 0.18 | 0.10 |
| Alpha | 1.55 | Stream Power (lb/ft s) | 0.03 | 0.29 | 0.07 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 4.58 | 7.60 | 16.22 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.17 | 0.89 | 4.41 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 680 Profile: 100 Yr

| E.G. Elev (ft) | 56.20 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.18 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 258.61 | 792.53 | 1932.23 |
| E.G. Slope (ft/ft) | 0.000358 | Area (sq ft) | 258.61 | 792.53 | 2182.57 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 144.88 | 1289.40 | 1529.72 |
| Top Width (ft) | 671.65 | Top Width (ft) | 91.44 | 96.38 | 483.83 |
| Vel Total (ft/s) | 0.99 | Avg. Vel. (ft/s) | 0.56 | 1.63 | 0.79 |
| Max Chl Dpth (ft) | 11.70 | Hydr. Depth (ft) | 2.83 | 8.22 | 4.77 |
| Conv. Total (cfs) | 156629.5 | Conv. (cfs) | 7655.8 | 68137.2 | 80836.5 |
| Length Wtd. (ft) | 90.26 | Wetted Per. (ft) | 91.96 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.06 | 0.18 | 0.11 |
| Alpha | 1.51 | Stream Power (lb/ft s) | 0.04 | 0.30 | 0.08 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 5.15 | 7.98 | 18.20 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.21 | 0.89 | 4.48 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 680 Profile: 200 Yr

| E.G. Elev (ft) | 56.76 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.74 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 311.96 | 846.63 | 2159.67 |
| E.G. Slope (ft/ft) | 0.000339 | Area (sq ft) | 311.96 | 846.63 | 2454.64 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 183.32 | 1401.17 | 1792.52 |
| Top Width (ft) | 680.55 | Top Width (ft) | 98.63 | 96.38 | 485.54 |
| Vel Total (ft/s) | 1.02 | Avg. Vel. (ft/s) | 0.59 | 1.65 | 0.83 |
| Max Chl Dpth (ft) | 12.26 | Hydr. Depth (ft) | 3.16 | 8.78 | 5.33 |
| Conv. Total (cfs) | 183326.2 | Conv. (cfs) | 9951.7 | 76064.6 | 97309.9 |
| Length Wtd. (ft) | 90.74 | Wetted Per. (ft) | 99.17 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.07 | 0.18 | 0.11 |
| Alpha | 1.47 | Stream Power (lb/ft s) | 0.04 | 0.31 | 0.09 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 5.74 | 8.36 | 20.22 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.25 | 0.89 | 4.55 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 680 Profile: 500 Yr

| E.G. Elev (ft) | 57.52 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.02 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.50 | Reach Len. (ft) | 162.38 | 80.00 | 81.32 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 390.43 | 919.72 | 2466.94 |
| E.G. Slope (ft/ft) | 0.000317 | Area (sq ft) | 390.43 | 919.72 | 2823.72 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 242.12 | 1555.79 | 2164.09 |
| Top Width (ft) | 692.57 | Top Width (ft) | 108.33 | 96.38 | 487.85 |
| Vel Total (ft/s) | 1.05 | Avg. Vel. (ft/s) | 0.62 | 1.69 | 0.88 |
| Max Chl Dpth (ft) | 13.02 | Hydr. Depth (ft) | 3.60 | 9.54 | 6.09 |
| Conv. Total (cfs) | 222372.4 | Conv. (cfs) | 13589.3 | 87321.0 | 121462.1 |
| Length Wtd. (ft) | 91.26 | Wetted Per. (ft) | 108.91 | 97.23 | 409.00 |
| Min Ch El (ft) | 44.48 | Shear (lb/sq ft) | 0.07 | 0.19 | 0.12 |
| Alpha | 1.42 | Stream Power (lb/ft s) | 0.04 | 0.32 | 0.10 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 6.56 | 8.87 | 22.97 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 1.31 | 0.89 | 4.69 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 600 Profile: 10 Yr

| E.G. Elev (ft) | 54.29 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.25 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 332.75 | 321.52 | 827.62 |
| E.G. Slope (ft/ft) | 0.000560 | Area (sq ft) | 332.75 | 321.52 | 1433.54 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 271.97 | 658.24 | 798.79 |
| Top Width (ft) | 516.02 | Top Width (ft) | 92.49 | 38.63 | 384.89 |
| Vel Total (ft/s) | 1.17 | Avg. Vel. (ft/s) | 0.82 | 2.05 | 0.97 |
| Max Chl Dpth (ft) | 9.43 | Hydr. Depth (ft) | 3.60 | 8.32 | 4.56 |
| Conv. Total (cfs) | 73081.9 | Conv. (cfs) | 11495.7 | 27822.5 | 33763.6 |
| Length Wtd. (ft) | 73.49 | Wetted Per. (ft) | 93.86 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.12 | 0.29 | 0.16 |
| Alpha | 1.57 | Stream Power (lb/ft s) | 0.10 | 0.59 | 0.15 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 2.46 | 5.81 | 9.02 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.80 | 0.76 | 3.40 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 600    Profile: 50 Yr

| E.G. Elev (ft) | 55.61 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.57 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 456.73 | 372.15 | 1065.33 |
| E.G. Slope (ft/ft) | 0.000593 | Area (sq ft) | 456.73 | 372.15 | 1940.65 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 458.00 | 864.55 | 1252.46 |
| Top Width (ft) | 525.11 | Top Width (ft) | 97.46 | 38.63 | 389.02 |
| Vel Total (ft/s) | 1.36 | Avg. Vel. (ft/s) | 1.00 | 2.32 | 1.18 |
| Max Chl Dpth (ft) | 10.75 | Hydr. Depth (ft) | 4.69 | 9.63 | 5.87 |
| Conv. Total (cfs) | 105736.4 | Conv. (cfs) | 18806.5 | 35500.7 | 51429.2 |
| Length Wtd. (ft) | 74.62 | Wetted Per. (ft) | 99.01 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.17 | 0.35 | 0.22 |
| Alpha | 1.44 | Stream Power (lb/ft s) | 0.17 | 0.82 | 0.25 |
| Frctn Loss (ft) | 0.09 | Cum Volume (acre-ft) | 3.34 | 6.58 | 12.62 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 0.84 | 0.76 | 3.60 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 600    Profile: 100 Yr

| E.G. Elev (ft) | 56.16 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.11 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 511.06 | 393.38 | 1165.02 |
| E.G. Slope (ft/ft) | 0.000601 | Area (sq ft) | 511.06 | 393.38 | 2154.93 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 545.81 | 954.65 | 1463.55 |
| Top Width (ft) | 529.59 | Top Width (ft) | 100.21 | 38.63 | 390.75 |
| Vel Total (ft/s) | 1.43 | Avg. Vel. (ft/s) | 1.07 | 2.43 | 1.26 |
| Max Chl Dpth (ft) | 11.29 | Hydr. Depth (ft) | 5.10 | 10.18 | 6.42 |
| Conv. Total (cfs) | 120900.9 | Conv. (cfs) | 22263.3 | 38939.9 | 59697.7 |
| Length Wtd. (ft) | 74.99 | Wetted Per. (ft) | 101.81 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.19 | 0.38 | 0.24 |
| Alpha | 1.41 | Stream Power (lb/ft s) | 0.20 | 0.92 | 0.30 |
| Frctn Loss (ft) | 0.09 | Cum Volume (acre-ft) | 3.71 | 6.89 | 14.15 |
| C & E Loss (ft) | 0.05 | Cum SA (acres) | 0.86 | 0.76 | 3.66 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 600    Profile: 200 Yr

| E.G. Elev (ft) | 56.72 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.67 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 567.80 | 414.97 | 1266.42 |
| E.G. Slope (ft/ft) | 0.000605 | Area (sq ft) | 567.80 | 414.97 | 2373.86 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 641.79 | 1047.29 | 1687.93 |
| Top Width (ft) | 533.92 | Top Width (ft) | 102.78 | 38.63 | 392.51 |
| Vel Total (ft/s) | 1.50 | Avg. Vel. (ft/s) | 1.13 | 2.52 | 1.33 |
| Max Chl Dpth (ft) | 11.85 | Hydr. Depth (ft) | 5.52 | 10.74 | 6.98 |
| Conv. Total (cfs) | 137259.4 | Conv. (cfs) | 26085.7 | 42567.4 | 68606.4 |
| Length Wtd. (ft) | 75.34 | Wetted Per. (ft) | 104.44 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.21 | 0.40 | 0.26 |
| Alpha | 1.38 | Stream Power (lb/ft s) | 0.23 | 1.01 | 0.35 |
| Frctn Loss (ft) | 0.09 | Cum Volume (acre-ft) | 4.10 | 7.21 | 15.72 |
| C & E Loss (ft) | 0.05 | Cum SA (acres) | 0.88 | 0.76 | 3.73 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 600 Profile: 500 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 57.48 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 57.43 | Reach Len. (ft) | 129.06 | 65.00 | 62.22 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 647.16 | 444.14 | 1403.39 |
| E.G. Slope (ft/ft) | 0.000610 | Area (sq ft) | 647.16 | 444.14 | 2671.14 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 773.87 | 1177.37 | 2010.77 |
| Top Width (ft) | 541.83 | Top Width (ft) | 108.31 | 38.63 | 394.89 |
| Vel Total (ft/s) | 1.59 | Avg. Vel. (ft/s) | 1.20 | 2.65 | 1.43 |
| Max Chl Dpth (ft) | 12.61 | Hydr. Depth (ft) | 5.97 | 11.50 | 7.74 |
| Conv. Total (cfs) | 160417.2 | Conv. (cfs) | 31333.0 | 47670.4 | 81413.8 |
| Length Wtd. (ft) | 75.70 | Wetted Per. (ft) | 110.03 | 39.06 | 181.92 |
| Min Ch El (ft) | 44.82 | Shear (lb/sq ft) | 0.22 | 0.43 | 0.29 |
| Alpha | 1.35 | Stream Power (lb/ft s) | 0.27 | 1.15 | 0.42 |
| Frctn Loss (ft) | 0.10 | Cum Volume (acre-ft) | 4.63 | 7.62 | 17.84 |
| C & E Loss (ft) | 0.07 | Cum SA (acres) | 0.90 | 0.76 | 3.87 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 535 Profile: 10 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 54.19 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.26 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.93 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 48.78 | Flow Area (sq ft) | 113.68 | 268.22 | 109.73 |
| E.G. Slope (ft/ft) | 0.002193 | Area (sq ft) | 415.35 | 268.22 | 1303.47 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 231.78 | 1243.22 | 253.99 |
| Top Width (ft) | 514.37 | Top Width (ft) | 109.47 | 26.15 | 378.75 |
| Vel Total (ft/s) | 3.52 | Avg. Vel. (ft/s) | 2.04 | 4.64 | 2.31 |
| Max Chl Dpth (ft) | 10.76 | Hydr. Depth (ft) | 5.24 | 10.26 | 6.40 |
| Conv. Total (cfs) | 36919.6 | Conv. (cfs) | 4949.3 | 26546.7 | 5423.6 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 22.67 | 26.64 | 18.09 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 0.69 | 1.38 | 0.83 |
| Alpha | 1.36 | Stream Power (lb/ft s) | 1.40 | 6.39 | 1.92 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 1.35 | 5.37 | 7.07 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 0.50 | 0.72 | 2.85 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 535 Profile: 50 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.48 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.43 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.05 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 50.46 | Flow Area (sq ft) | 137.97 | 297.48 | 128.91 |
| E.G. Slope (ft/ft) | 0.003206 | Area (sq ft) | 539.55 | 297.48 | 1729.63 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 387.02 | 1786.30 | 401.68 |
| Top Width (ft) | 521.57 | Top Width (ft) | 112.51 | 26.15 | 382.91 |
| Vel Total (ft/s) | 4.56 | Avg. Vel. (ft/s) | 2.81 | 6.00 | 3.12 |
| Max Chl Dpth (ft) | 11.88 | Hydr. Depth (ft) | 6.36 | 11.38 | 7.52 |
| Conv. Total (cfs) | 45476.4 | Conv. (cfs) | 6835.0 | 31547.5 | 7094.0 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 22.67 | 26.64 | 18.09 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 1.22 | 2.24 | 1.43 |
| Alpha | 1.33 | Stream Power (lb/ft s) | 3.42 | 13.42 | 4.44 |
| Frctn Loss (ft) | 0.10 | Cum Volume (acre-ft) | 1.86 | 6.08 | 10.00 |
| C & E Loss (ft) | 0.08 | Cum SA (acres) | 0.53 | 0.72 | 3.04 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 535    Profile: 100 Yr

| E.G. Elev (ft) | 56.02 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.51 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.51 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 50.91 | Flow Area (sq ft) | 147.98 | 309.53 | 136.81 |
| E.G. Slope (ft/ft) | 0.003626 | Area (sq ft) | 591.68 | 309.53 | 1906.47 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 462.54 | 2029.76 | 471.70 |
| Top Width (ft) | 524.53 | Top Width (ft) | 113.76 | 26.15 | 384.62 |
| Vel Total (ft/s) | 4.99 | Avg. Vel. (ft/s) | 3.13 | 6.56 | 3.45 |
| Max Chl Dpth (ft) | 12.34 | Hydr. Depth (ft) | 6.82 | 11.84 | 7.98 |
| Conv. Total (cfs) | 49219.7 | Conv. (cfs) | 7680.8 | 33705.9 | 7833.0 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 22.67 | 26.64 | 18.09 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 1.48 | 2.63 | 1.71 |
| Alpha | 1.32 | Stream Power (lb/ft s) | 4.62 | 17.25 | 5.90 |
| Frctn Loss (ft) | 0.11 | Cum Volume (acre-ft) | 2.08 | 6.37 | 11.25 |
| C & E Loss (ft) | 0.10 | Cum SA (acres) | 0.54 | 0.72 | 3.11 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 535    Profile: 200 Yr

| E.G. Elev (ft) | 56.57 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.60 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.98 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 51.34 | Flow Area (sq ft) | 158.07 | 321.69 | 144.78 |
| E.G. Slope (ft/ft) | 0.004041 | Area (sq ft) | 644.88 | 321.69 | 2085.73 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 545.03 | 2284.76 | 547.22 |
| Top Width (ft) | 527.52 | Top Width (ft) | 115.02 | 26.15 | 386.35 |
| Vel Total (ft/s) | 5.41 | Avg. Vel. (ft/s) | 3.45 | 7.10 | 3.78 |
| Max Chl Dpth (ft) | 12.81 | Hydr. Depth (ft) | 7.28 | 12.30 | 8.45 |
| Conv. Total (cfs) | 53123.9 | Conv. (cfs) | 8573.9 | 35941.7 | 8608.3 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 22.67 | 26.64 | 18.09 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 1.76 | 3.05 | 2.02 |
| Alpha | 1.31 | Stream Power (lb/ft s) | 6.07 | 21.64 | 7.63 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 2.30 | 6.66 | 12.53 |
| C & E Loss (ft) | 0.12 | Cum SA (acres) | 0.55 | 0.72 | 3.17 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 535    Profile: 500 Yr

| E.G. Elev (ft) | 57.32 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.72 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.60 | Reach Len. (ft) | 25.00 | 25.00 | 25.00 |
| Crit W.S. (ft) | 51.92 | Flow Area (sq ft) | 171.59 | 337.97 | 155.45 |
| E.G. Slope (ft/ft) | 0.004580 | Area (sq ft) | 717.00 | 337.97 | 2326.95 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 665.24 | 2640.90 | 655.86 |
| Top Width (ft) | 531.53 | Top Width (ft) | 116.72 | 26.15 | 388.66 |
| Vel Total (ft/s) | 5.96 | Avg. Vel. (ft/s) | 3.88 | 7.81 | 4.22 |
| Max Chl Dpth (ft) | 13.43 | Hydr. Depth (ft) | 7.90 | 12.92 | 9.07 |
| Conv. Total (cfs) | 58545.2 | Conv. (cfs) | 9830.1 | 39023.7 | 9691.4 |
| Length Wtd. (ft) | 25.00 | Wetted Per. (ft) | 22.67 | 26.64 | 18.09 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 2.16 | 3.63 | 2.46 |
| Alpha | 1.30 | Stream Power (lb/ft s) | 8.39 | 28.34 | 10.37 |
| Frctn Loss (ft) | 0.15 | Cum Volume (acre-ft) | 2.61 | 7.04 | 14.27 |
| C & E Loss (ft) | 0.15 | Cum SA (acres) | 0.57 | 0.72 | 3.31 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503    BR U    Profile: 10 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 54.09 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.40 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.69 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 48.69 | Flow Area (sq ft) | 89.72 | 261.80 | 60.10 |
| E.G. Slope (ft/ft) | 0.003178 | Area (sq ft) | 89.72 | 261.80 | 60.10 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 181.95 | 1437.36 | 109.69 |
| Top Width (ft) | 61.37 | Top Width (ft) | 21.71 | 26.15 | 13.51 |
| Vel Total (ft/s) | 4.20 | Avg. Vel. (ft/s) | 2.03 | 5.49 | 1.83 |
| Max Chl Dpth (ft) | 10.52 | Hydr. Depth (ft) | 4.13 | 10.01 | 4.45 |
| Conv. Total (cfs) | 30669.4 | Conv. (cfs) | 3227.4 | 25496.3 | 1945.7 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 23.82 | 26.64 | 18.69 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 0.75 | 1.95 | 0.64 |
| Alpha | 1.46 | Stream Power (lb/ft s) | 1.52 | 10.71 | 1.16 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.21 | 5.22 | 6.68 |
| C & E Loss (ft) | 0.12 | Cum SA (acres) | 0.46 | 0.70 | 2.74 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503    BR U    Profile: 50 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.30 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.70 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.60 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 49.99 | Flow Area (sq ft) | 109.63 | 285.78 | 73.53 |
| E.G. Slope (ft/ft) | 0.005032 | Area (sq ft) | 109.63 | 285.78 | 73.53 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 311.79 | 2093.10 | 170.11 |
| Top Width (ft) | 65.00 | Top Width (ft) | 21.71 | 26.15 | 17.14 |
| Vel Total (ft/s) | 5.49 | Avg. Vel. (ft/s) | 2.84 | 7.32 | 2.31 |
| Max Chl Dpth (ft) | 11.43 | Hydr. Depth (ft) | 5.05 | 10.93 | 4.29 |
| Conv. Total (cfs) | 36300.6 | Conv. (cfs) | 4395.4 | 29507.2 | 2398.0 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 24.74 | 26.64 | 22.61 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 1.39 | 3.37 | 1.02 |
| Alpha | 1.49 | Stream Power (lb/ft s) | 3.96 | 24.68 | 2.36 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 1.67 | 5.91 | 9.48 |
| C & E Loss (ft) | 0.21 | Cum SA (acres) | 0.49 | 0.70 | 2.93 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503    BR U    Profile: 100 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.81 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.84 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.97 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 50.63 | Flow Area (sq ft) | 117.59 | 295.37 | 79.81 |
| E.G. Slope (ft/ft) | 0.005840 | Area (sq ft) | 117.59 | 295.37 | 79.81 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 373.82 | 2382.33 | 207.85 |
| Top Width (ft) | 65.00 | Top Width (ft) | 21.71 | 26.15 | 17.14 |
| Vel Total (ft/s) | 6.01 | Avg. Vel. (ft/s) | 3.18 | 8.07 | 2.60 |
| Max Chl Dpth (ft) | 11.80 | Hydr. Depth (ft) | 5.42 | 11.30 | 4.66 |
| Conv. Total (cfs) | 38787.2 | Conv. (cfs) | 4891.8 | 31175.4 | 2719.9 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 25.10 | 26.64 | 22.98 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 1.71 | 4.04 | 1.27 |
| Alpha | 1.49 | Stream Power (lb/ft s) | 5.43 | 32.60 | 3.30 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 1.88 | 6.19 | 10.68 |
| C & E Loss (ft) | 0.24 | Cum SA (acres) | 0.50 | 0.70 | 2.99 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 503 BR U Profile: 200 Yr

| E.G. Elev (ft) | 56.32 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 1.00 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.33 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 51.28 | Flow Area (sq ft) | 125.38 | 304.75 | 85.96 |
| E.G. Slope (ft/ft) | 0.006692 | Area (sq ft) | 125.38 | 304.75 | 85.96 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 441.11 | 2686.69 | 249.20 |
| Top Width (ft) | 65.00 | Top Width (ft) | 21.71 | 26.15 | 17.14 |
| Vel Total (ft/s) | 6.54 | Avg. Vel. (ft/s) | 3.52 | 8.82 | 2.90 |
| Max Chl Dpth (ft) | 12.16 | Hydr. Depth (ft) | 5.78 | 11.65 | 5.02 |
| Conv. Total (cfs) | 41280.8 | Conv. (cfs) | 5392.2 | 32842.3 | 3046.3 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 25.46 | 26.64 | 23.34 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 2.06 | 4.78 | 1.54 |
| Alpha | 1.50 | Stream Power (lb/ft s) | 7.24 | 42.13 | 4.46 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 2.08 | 6.48 | 11.91 |
| C & E Loss (ft) | 0.29 | Cum SA (acres) | 0.51 | 0.70 | 3.06 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 503 BR U Profile: 500 Yr

| E.G. Elev (ft) | 57.01 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 1.23 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.79 | Reach Len. (ft) | 13.60 | 13.60 | 13.60 |
| Crit W.S. (ft) | 52.06 | Flow Area (sq ft) | 135.33 | 316.73 | 93.81 |
| E.G. Slope (ft/ft) | 0.007908 | Area (sq ft) | 135.33 | 316.73 | 93.81 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 538.15 | 3114.49 | 309.36 |
| Top Width (ft) | 65.00 | Top Width (ft) | 21.71 | 26.15 | 17.14 |
| Vel Total (ft/s) | 7.26 | Avg. Vel. (ft/s) | 3.98 | 9.83 | 3.30 |
| Max Chl Dpth (ft) | 12.62 | Hydr. Depth (ft) | 6.23 | 12.11 | 5.47 |
| Conv. Total (cfs) | 44553.1 | Conv. (cfs) | 6051.6 | 35022.7 | 3478.8 |
| Length Wtd. (ft) | 13.60 | Wetted Per. (ft) | 25.92 | 26.64 | 23.80 |
| Min Ch El (ft) | 43.17 | Shear (lb/sq ft) | 2.58 | 5.87 | 1.95 |
| Alpha | 1.50 | Stream Power (lb/ft s) | 10.25 | 57.72 | 6.42 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 2.36 | 6.85 | 13.58 |
| C & E Loss (ft) | 0.35 | Cum SA (acres) | 0.53 | 0.70 | 3.19 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 503 BR D Profile: 10 Yr

| E.G. Elev (ft) | 53.94 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.16 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.78 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 44.46 | Flow Area (sq ft) |  | 529.12 | 34.75 |
| E.G. Slope (ft/ft) | 0.001320 | Area (sq ft) |  | 529.12 | 34.75 |
| Q Total (cfs) | 1729.00 | Flow (cfs) |  | 1695.40 | 33.61 |
| Top Width (ft) | 61.56 | Top Width (ft) |  | 49.68 | 11.88 |
| Vel Total (ft/s) | 3.07 | Avg. Vel. (ft/s) |  | 3.20 | 0.97 |
| Max Chl Dpth (ft) | 14.46 | Hydr. Depth (ft) |  | 10.65 | 2.93 |
| Conv. Total (cfs) | 47592.0 | Conv. (cfs) |  | 46667.0 | 925.0 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 62.48 | 14.49 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) |  | 0.70 | 0.20 |
| Alpha | 1.07 | Stream Power (lb/ft s) |  | 2.24 | 0.19 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 1.19 | 5.09 | 6.66 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.46 | 0.69 | 2.73 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 503 BR D Profile: 50 Yr

| E.G. Elev (ft) | 55.05 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.29 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.77 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 45.77 | Flow Area (sq ft) |  | 578.04 | 47.88 |
| E.G. Slope (ft/ft) | 0.002203 | Area (sq ft) |  | 578.04 | 47.88 |
| Q Total (cfs) | 2575.00 | Flow (cfs) |  | 2511.76 | 63.24 |
| Top Width (ft) | 65.00 | Top Width (ft) |  | 49.68 | 15.32 |
| Vel Total (ft/s) | 4.11 | Avg. Vel. (ft/s) |  | 4.35 | 1.32 |
| Max Chl Dpth (ft) | 15.45 | Hydr. Depth (ft) |  | 11.64 | 3.13 |
| Conv. Total (cfs) | 54863.4 | Conv. (cfs) |  | 53516.0 | 1347.4 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 63.46 | 18.37 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) |  | 1.25 | 0.36 |
| Alpha | 1.09 | Stream Power (lb/ft s) |  | 5.44 | 0.47 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.66 | 5.77 | 9.46 |
| C & E Loss (ft) | 0.06 | Cum SA (acres) | 0.49 | 0.69 | 2.92 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 503 BR D Profile: 100 Yr

| E.G. Elev (ft) | 55.51 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.35 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.16 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 46.31 | Flow Area (sq ft) |  | 597.77 | 53.96 |
| E.G. Slope (ft/ft) | 0.002613 | Area (sq ft) |  | 597.77 | 53.96 |
| Q Total (cfs) | 2964.00 | Flow (cfs) |  | 2881.11 | 82.89 |
| Top Width (ft) | 65.00 | Top Width (ft) |  | 49.68 | 15.32 |
| Vel Total (ft/s) | 4.55 | Avg. Vel. (ft/s) |  | 4.82 | 1.54 |
| Max Chl Dpth (ft) | 15.84 | Hydr. Depth (ft) |  | 12.03 | 3.52 |
| Conv. Total (cfs) | 57981.4 | Conv. (cfs) |  | 56360.0 | 1621.4 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 63.86 | 18.76 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) |  | 1.53 | 0.47 |
| Alpha | 1.09 | Stream Power (lb/ft s) |  | 7.36 | 0.72 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 1.86 | 6.05 | 10.66 |
| C & E Loss (ft) | 0.07 | Cum SA (acres) | 0.50 | 0.69 | 2.99 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 503 BR D Profile: 200 Yr

| E.G. Elev (ft) | 55.98 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.42 | Wt. n-Val. |  | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.55 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 46.86 | Flow Area (sq ft) |  | 617.25 | 59.97 |
| E.G. Slope (ft/ft) | 0.003053 | Area (sq ft) |  | 617.25 | 59.97 |
| Q Total (cfs) | 3377.00 | Flow (cfs) |  | 3271.64 | 105.36 |
| Top Width (ft) | 65.00 | Top Width (ft) |  | 49.68 | 15.32 |
| Vel Total (ft/s) | 4.99 | Avg. Vel. (ft/s) |  | 5.30 | 1.76 |
| Max Chl Dpth (ft) | 16.23 | Hydr. Depth (ft) |  | 12.42 | 3.91 |
| Conv. Total (cfs) | 61118.8 | Conv. (cfs) |  | 59211.9 | 1906.8 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) |  | 64.25 | 19.16 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) |  | 1.83 | 0.60 |
| Alpha | 1.10 | Stream Power (lb/ft s) |  | 9.70 | 1.05 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 2.06 | 6.33 | 11.88 |
| C & E Loss (ft) | 0.09 | Cum SA (acres) | 0.51 | 0.69 | 3.05 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503     BR D     Profile: 500 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 56.60 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.53 | Wt. n-Val. | | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.06 | Reach Len. (ft) | 26.40 | 26.40 | 26.40 |
| Crit W.S. (ft) | 47.56 | Flow Area (sq ft) | | 642.50 | 67.75 |
| E.G. Slope (ft/ft) | 0.003685 | Area (sq ft) | | 642.50 | 67.75 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | | 3822.59 | 139.41 |
| Top Width (ft) | 65.00 | Top Width (ft) | | 49.68 | 15.32 |
| Vel Total (ft/s) | 5.58 | Avg. Vel. (ft/s) | | 5.95 | 2.06 |
| Max Chl Dpth (ft) | 16.74 | Hydr. Depth (ft) | | 12.93 | 4.42 |
| Conv. Total (cfs) | 65268.5 | Conv. (cfs) | | 62971.9 | 2296.6 |
| Length Wtd. (ft) | 26.40 | Wetted Per. (ft) | | 64.76 | 19.66 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | | 2.28 | 0.79 |
| Alpha | 1.10 | Stream Power (lb/ft s) | | 13.58 | 1.63 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 2.34 | 6.70 | 13.55 |
| C & E Loss (ft) | 0.11 | Cum SA (acres) | 0.53 | 0.69 | 3.19 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 470    Profile: 10 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 53.88 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.09 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.79 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 75.03 | 650.57 | 61.53 |
| E.G. Slope (ft/ft) | 0.000481 | Area (sq ft) | 91.29 | 650.57 | 677.27 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 74.95 | 1605.87 | 48.19 |
| Top Width (ft) | 367.70 | Top Width (ft) | 37.67 | 50.76 | 279.26 |
| Vel Total (ft/s) | 2.20 | Avg. Vel. (ft/s) | 1.00 | 2.47 | 0.78 |
| Max Chl Dpth (ft) | 14.47 | Hydr. Depth (ft) | 6.80 | 12.82 | 4.02 |
| Conv. Total (cfs) | 78865.6 | Conv. (cfs) | 3418.6 | 73249.1 | 2197.9 |
| Length Wtd. (ft) | 45.20 | Wetted Per. (ft) | 13.97 | 53.26 | 16.51 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.16 | 0.37 | 0.11 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 0.16 | 0.90 | 0.09 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | 1.16 | 4.74 | 6.45 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.44 | 0.66 | 2.65 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 470    Profile: 50 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 54.96 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.16 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.79 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 86.05 | 701.27 | 76.83 |
| E.G. Slope (ft/ft) | 0.000810 | Area (sq ft) | 132.58 | 701.27 | 958.41 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 122.24 | 2362.19 | 90.57 |
| Top Width (ft) | 379.43 | Top Width (ft) | 45.00 | 50.76 | 283.67 |
| Vel Total (ft/s) | 2.98 | Avg. Vel. (ft/s) | 1.42 | 3.37 | 1.18 |
| Max Chl Dpth (ft) | 15.47 | Hydr. Depth (ft) | 7.80 | 13.82 | 5.01 |
| Conv. Total (cfs) | 90486.6 | Conv. (cfs) | 4295.6 | 83008.5 | 3182.6 |
| Length Wtd. (ft) | 45.39 | Wetted Per. (ft) | 13.97 | 53.26 | 16.51 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.31 | 0.67 | 0.24 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 0.44 | 2.24 | 0.28 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.62 | 5.39 | 9.15 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.47 | 0.66 | 2.83 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 470    Profile: 100 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.40 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.20 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.20 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 90.50 | 721.78 | 83.02 |
| E.G. Slope (ft/ft) | 0.000966 | Area (sq ft) | 151.37 | 721.78 | 1073.40 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 145.20 | 2706.28 | 112.53 |
| Top Width (ft) | 384.17 | Top Width (ft) | 47.96 | 50.76 | 285.45 |
| Vel Total (ft/s) | 3.31 | Avg. Vel. (ft/s) | 1.60 | 3.75 | 1.36 |
| Max Chl Dpth (ft) | 15.88 | Hydr. Depth (ft) | 8.21 | 14.22 | 5.42 |
| Conv. Total (cfs) | 95388.7 | Conv. (cfs) | 4672.8 | 87094.5 | 3621.4 |
| Length Wtd. (ft) | 45.47 | Wetted Per. (ft) | 13.97 | 53.26 | 16.51 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.39 | 0.82 | 0.30 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 0.63 | 3.06 | 0.41 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.81 | 5.65 | 10.32 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 0.48 | 0.66 | 2.90 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 470    Profile: 200 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.84 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.25 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.60 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 94.91 | 742.09 | 89.15 |
| E.G. Slope (ft/ft) | 0.001132 | Area (sq ft) | 171.13 | 742.09 | 1187.94 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 170.23 | 3069.55 | 137.22 |
| Top Width (ft) | 388.84 | Top Width (ft) | 50.87 | 50.76 | 287.21 |
| Vel Total (ft/s) | 3.65 | Avg. Vel. (ft/s) | 1.79 | 4.14 | 1.54 |
| Max Chl Dpth (ft) | 16.28 | Hydr. Depth (ft) | 8.61 | 14.62 | 5.82 |
| Conv. Total (cfs) | 100352.6 | Conv. (cfs) | 5058.6 | 91216.2 | 4077.8 |
| Length Wtd. (ft) | 45.54 | Wetted Per. (ft) | 13.97 | 53.26 | 16.51 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.48 | 0.99 | 0.38 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 0.86 | 4.07 | 0.59 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 2.01 | 5.92 | 11.51 |
| C & E Loss (ft) | 0.05 | Cum SA (acres) | 0.50 | 0.66 | 2.96 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 470    Profile: 500 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 56.43 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.31 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.12 | Reach Len. (ft) | 35.97 | 45.00 | 65.60 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 100.65 | 768.50 | 97.12 |
| E.G. Slope (ft/ft) | 0.001372 | Area (sq ft) | 198.59 | 768.50 | 1337.99 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 206.62 | 3581.18 | 174.20 |
| Top Width (ft) | 394.93 | Top Width (ft) | 54.66 | 50.76 | 289.50 |
| Vel Total (ft/s) | 4.10 | Avg. Vel. (ft/s) | 2.05 | 4.66 | 1.79 |
| Max Chl Dpth (ft) | 16.80 | Hydr. Depth (ft) | 9.13 | 15.14 | 6.34 |
| Conv. Total (cfs) | 106973.5 | Conv. (cfs) | 5578.7 | 96691.3 | 4703.5 |
| Length Wtd. (ft) | 45.64 | Wetted Per. (ft) | 13.97 | 53.26 | 16.51 |
| Min Ch El (ft) | 39.32 | Shear (lb/sq ft) | 0.62 | 1.24 | 0.50 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 1.27 | 5.76 | 0.90 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 2.28 | 6.27 | 13.12 |
| C & E Loss (ft) | 0.06 | Cum SA (acres) | 0.51 | 0.66 | 3.09 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 425    Profile: 10 Yr

| E.G. Elev (ft) | 53.85 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.80 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 9.66 | 903.50 | 65.30 |
| E.G. Slope (ft/ft) | 0.000299 | Area (sq ft) | 72.13 | 903.50 | 94.04 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 5.46 | 1702.86 | 20.68 |
| Top Width (ft) | 175.42 | Top Width (ft) | 35.18 | 73.10 | 67.14 |
| Vel Total (ft/s) | 1.77 | Avg. Vel. (ft/s) | 0.56 | 1.88 | 0.32 |
| Max Chl Dpth (ft) | 16.24 | Hydr. Depth (ft) | 4.04 | 12.36 | 1.44 |
| Conv. Total (cfs) | 99987.0 | Conv. (cfs) | 315.5 | 98475.3 | 1196.1 |
| Length Wtd. (ft) | 50.55 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.06 | 0.22 | 0.03 |
| Alpha | 1.12 | Stream Power (lb/ft s) | 0.03 | 0.41 | 0.01 |
| Frctn Loss (ft) | 0.03 | Cum Volume (acre-ft) | 1.10 | 3.93 | 5.86 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.41 | 0.59 | 2.38 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 425    Profile: 50 Yr

| E.G. Elev (ft) | 54.90 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.10 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.80 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 12.06 | 976.79 | 110.92 |
| E.G. Slope (ft/ft) | 0.000497 | Area (sq ft) | 109.26 | 976.79 | 165.45 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 10.18 | 2500.34 | 64.49 |
| Top Width (ft) | 187.93 | Top Width (ft) | 38.88 | 73.10 | 75.95 |
| Vel Total (ft/s) | 2.34 | Avg. Vel. (ft/s) | 0.84 | 2.56 | 0.58 |
| Max Chl Dpth (ft) | 17.24 | Hydr. Depth (ft) | 5.05 | 13.36 | 2.44 |
| Conv. Total (cfs) | 115494.5 | Conv. (cfs) | 456.4 | 112145.7 | 2892.3 |
| Length Wtd. (ft) | 50.82 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.13 | 0.39 | 0.07 |
| Alpha | 1.16 | Stream Power (lb/ft s) | 0.11 | 1.00 | 0.04 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 1.52 | 4.52 | 8.31 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.44 | 0.59 | 2.56 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 425    Profile: 100 Yr

| E.G. Elev (ft) | 55.33 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.12 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.20 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 13.03 | 1006.52 | 129.42 |
| E.G. Slope (ft/ft) | 0.000589 | Area (sq ft) | 125.37 | 1006.52 | 197.14 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 12.60 | 2860.63 | 90.77 |
| Top Width (ft) | 193.33 | Top Width (ft) | 40.38 | 73.10 | 79.86 |
| Vel Total (ft/s) | 2.58 | Avg. Vel. (ft/s) | 0.97 | 2.84 | 0.70 |
| Max Chl Dpth (ft) | 17.64 | Hydr. Depth (ft) | 5.45 | 13.77 | 2.84 |
| Conv. Total (cfs) | 122153.2 | Conv. (cfs) | 519.4 | 117893.1 | 3740.7 |
| Length Wtd. (ft) | 50.93 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.16 | 0.48 | 0.10 |
| Alpha | 1.17 | Stream Power (lb/ft s) | 0.16 | 1.35 | 0.07 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 1.70 | 4.76 | 9.36 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.45 | 0.59 | 2.62 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 425 Profile: 200 Yr

| E.G. Elev (ft) | 55.75 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.15 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.61 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 14.00 | 1036.02 | 147.78 |
| E.G. Slope (ft/ft) | 0.000686 | Area (sq ft) | 141.97 | 1036.02 | 230.14 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 15.32 | 3239.49 | 122.19 |
| Top Width (ft) | 198.69 | Top Width (ft) | 41.86 | 73.10 | 83.73 |
| Vel Total (ft/s) | 2.82 | Avg. Vel. (ft/s) | 1.09 | 3.13 | 0.83 |
| Max Chl Dpth (ft) | 18.05 | Hydr. Depth (ft) | 5.86 | 14.17 | 3.25 |
| Conv. Total (cfs) | 128957.9 | Conv. (cfs) | 585.0 | 123706.7 | 4666.2 |
| Length Wtd. (ft) | 51.07 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.20 | 0.57 | 0.13 |
| Alpha | 1.18 | Stream Power (lb/ft s) | 0.22 | 1.79 | 0.11 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 1.88 | 5.00 | 10.44 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.46 | 0.59 | 2.68 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 425 Profile: 500 Yr

| E.G. Elev (ft) | 56.32 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.18 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 56.13 | Reach Len. (ft) | 28.69 | 50.00 | 70.51 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 15.25 | 1074.49 | 171.73 |
| E.G. Slope (ft/ft) | 0.000823 | Area (sq ft) | 164.51 | 1074.49 | 282.50 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 19.37 | 3770.72 | 171.91 |
| Top Width (ft) | 236.42 | Top Width (ft) | 43.81 | 73.10 | 119.51 |
| Vel Total (ft/s) | 3.14 | Avg. Vel. (ft/s) | 1.27 | 3.51 | 1.00 |
| Max Chl Dpth (ft) | 18.57 | Hydr. Depth (ft) | 6.38 | 14.70 | 3.77 |
| Conv. Total (cfs) | 138125.3 | Conv. (cfs) | 675.2 | 131456.9 | 5993.2 |
| Length Wtd. (ft) | 51.26 | Wetted Per. (ft) | 2.97 | 77.66 | 47.71 |
| Min Ch El (ft) | 37.56 | Shear (lb/sq ft) | 0.26 | 0.71 | 0.18 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 0.34 | 2.49 | 0.19 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 2.13 | 5.32 | 11.90 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.47 | 0.59 | 2.79 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 375 Profile: 10 Yr

| E.G. Elev (ft) | 53.81 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.13 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.68 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 77.15 | 466.53 | 159.04 |
| E.G. Slope (ft/ft) | 0.002201 | Area (sq ft) | 77.15 | 466.53 | 159.04 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 90.22 | 1468.14 | 170.64 |
| Top Width (ft) | 197.13 | Top Width (ft) | 34.45 | 79.72 | 82.96 |
| Vel Total (ft/s) | 2.46 | Avg. Vel. (ft/s) | 1.17 | 3.15 | 1.07 |
| Max Chl Dpth (ft) | 7.93 | Hydr. Depth (ft) | 2.24 | 5.85 | 1.92 |
| Conv. Total (cfs) | 36857.0 | Conv. (cfs) | 1923.1 | 31296.2 | 3637.6 |
| Length Wtd. (ft) | 79.99 | Wetted Per. (ft) | 35.51 | 83.04 | 83.28 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.30 | 0.77 | 0.26 |
| Alpha | 1.42 | Stream Power (lb/ft s) | 0.35 | 2.43 | 0.28 |
| Frctn Loss (ft) | 0.21 | Cum Volume (acre-ft) | 1.05 | 3.15 | 5.66 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.39 | 0.51 | 2.26 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 375    Profile: 50 Yr

| E.G. Elev (ft) | 54.84 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.19 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.65 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 111.98 | 544.41 | 249.57 |
| E.G. Slope (ft/ft) | 0.002611 | Area (sq ft) | 111.98 | 544.41 | 249.57 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 174.43 | 2068.48 | 332.09 |
| Top Width (ft) | 223.81 | Top Width (ft) | 36.86 | 79.72 | 107.23 |
| Vel Total (ft/s) | 2.84 | Avg. Vel. (ft/s) | 1.56 | 3.80 | 1.33 |
| Max Chl Dpth (ft) | 8.90 | Hydr. Depth (ft) | 3.04 | 6.83 | 2.33 |
| Conv. Total (cfs) | 50393.6 | Conv. (cfs) | 3413.7 | 40480.8 | 6499.1 |
| Length Wtd. (ft) | 81.77 | Wetted Per. (ft) | 38.11 | 83.04 | 107.57 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.48 | 1.07 | 0.38 |
| Alpha | 1.48 | Stream Power (lb/ft s) | 0.75 | 4.06 | 0.50 |
| Frctn Loss (ft) | 0.23 | Cum Volume (acre-ft) | 1.44 | 3.65 | 7.97 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.41 | 0.51 | 2.41 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 375    Profile: 100 Yr

| E.G. Elev (ft) | 55.26 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.21 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.05 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 126.97 | 576.40 | 295.20 |
| E.G. Slope (ft/ft) | 0.002740 | Area (sq ft) | 126.97 | 576.40 | 295.20 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 216.28 | 2330.55 | 417.17 |
| Top Width (ft) | 237.76 | Top Width (ft) | 37.85 | 79.72 | 120.19 |
| Vel Total (ft/s) | 2.97 | Avg. Vel. (ft/s) | 1.70 | 4.04 | 1.41 |
| Max Chl Dpth (ft) | 9.30 | Hydr. Depth (ft) | 3.35 | 7.23 | 2.46 |
| Conv. Total (cfs) | 56623.1 | Conv. (cfs) | 4131.7 | 44521.9 | 7969.4 |
| Length Wtd. (ft) | 82.37 | Wetted Per. (ft) | 39.18 | 83.04 | 120.54 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.55 | 1.19 | 0.42 |
| Alpha | 1.51 | Stream Power (lb/ft s) | 0.94 | 4.80 | 0.59 |
| Frctn Loss (ft) | 0.24 | Cum Volume (acre-ft) | 1.61 | 3.85 | 8.96 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.42 | 0.51 | 2.46 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 375    Profile: 200 Yr

| E.G. Elev (ft) | 55.68 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.23 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.46 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 142.38 | 608.44 | 346.11 |
| E.G. Slope (ft/ft) | 0.002843 | Area (sq ft) | 142.38 | 608.44 | 346.11 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 261.88 | 2597.71 | 517.41 |
| Top Width (ft) | 251.73 | Top Width (ft) | 38.84 | 79.72 | 133.17 |
| Vel Total (ft/s) | 3.08 | Avg. Vel. (ft/s) | 1.84 | 4.27 | 1.49 |
| Max Chl Dpth (ft) | 9.71 | Hydr. Depth (ft) | 3.67 | 7.63 | 2.60 |
| Conv. Total (cfs) | 63338.7 | Conv. (cfs) | 4911.8 | 48722.5 | 9704.4 |
| Length Wtd. (ft) | 82.92 | Wetted Per. (ft) | 40.25 | 83.04 | 133.53 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.63 | 1.30 | 0.46 |
| Alpha | 1.54 | Stream Power (lb/ft s) | 1.15 | 5.55 | 0.69 |
| Frctn Loss (ft) | 0.24 | Cum Volume (acre-ft) | 1.79 | 4.06 | 9.97 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.43 | 0.51 | 2.51 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 375    Profile: 500 Yr

| E.G. Elev (ft) | 56.24 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.25 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.99 | Reach Len. (ft) | 78.70 | 75.00 | 103.75 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 163.32 | 650.70 | 421.23 |
| E.G. Slope (ft/ft) | 0.002950 | Area (sq ft) | 163.32 | 650.70 | 421.23 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 327.69 | 2959.61 | 674.70 |
| Top Width (ft) | 270.16 | Top Width (ft) | 40.15 | 79.72 | 150.29 |
| Vel Total (ft/s) | 3.21 | Avg. Vel. (ft/s) | 2.01 | 4.55 | 1.60 |
| Max Chl Dpth (ft) | 10.24 | Hydr. Depth (ft) | 4.07 | 8.16 | 2.80 |
| Conv. Total (cfs) | 72947.5 | Conv. (cfs) | 6033.3 | 54491.7 | 12422.5 |
| Length Wtd. (ft) | 83.57 | Wetted Per. (ft) | 41.66 | 83.04 | 150.66 |
| Min Ch El (ft) | 45.75 | Shear (lb/sq ft) | 0.72 | 1.44 | 0.51 |
| Alpha | 1.58 | Stream Power (lb/ft s) | 1.45 | 6.56 | 0.82 |
| Frctn Loss (ft) | 0.24 | Cum Volume (acre-ft) | 2.02 | 4.33 | 11.33 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 0.44 | 0.51 | 2.57 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 300    Profile: 10 Yr

| E.G. Elev (ft) | 53.59 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.16 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.43 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 150.85 | 282.03 | 324.18 |
| E.G. Slope (ft/ft) | 0.003302 | Area (sq ft) | 150.85 | 282.03 | 324.18 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 229.50 | 1111.38 | 388.12 |
| Top Width (ft) | 302.72 | Top Width (ft) | 62.73 | 44.77 | 195.22 |
| Vel Total (ft/s) | 2.28 | Avg. Vel. (ft/s) | 1.52 | 3.94 | 1.20 |
| Max Chl Dpth (ft) | 7.98 | Hydr. Depth (ft) | 2.40 | 6.30 | 1.66 |
| Conv. Total (cfs) | 30086.7 | Conv. (cfs) | 3993.7 | 19339.3 | 6753.8 |
| Length Wtd. (ft) | 86.71 | Wetted Per. (ft) | 63.43 | 48.58 | 195.27 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.49 | 1.20 | 0.34 |
| Alpha | 2.03 | Stream Power (lb/ft s) | 0.75 | 4.72 | 0.41 |
| Frctn Loss (ft) | 0.11 | Cum Volume (acre-ft) | 0.84 | 2.50 | 5.08 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 0.30 | 0.40 | 1.93 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 300    Profile: 50 Yr

| E.G. Elev (ft) | 54.60 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.44 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 215.17 | 327.14 | 530.52 |
| E.G. Slope (ft/ft) | 0.003085 | Area (sq ft) | 215.17 | 327.14 | 530.52 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 391.01 | 1375.59 | 808.40 |
| Top Width (ft) | 321.13 | Top Width (ft) | 64.96 | 44.77 | 211.41 |
| Vel Total (ft/s) | 2.40 | Avg. Vel. (ft/s) | 1.82 | 4.20 | 1.52 |
| Max Chl Dpth (ft) | 8.99 | Hydr. Depth (ft) | 3.31 | 7.31 | 2.51 |
| Conv. Total (cfs) | 46357.4 | Conv. (cfs) | 7039.3 | 24764.5 | 14553.6 |
| Length Wtd. (ft) | 89.68 | Wetted Per. (ft) | 65.87 | 48.58 | 211.50 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.63 | 1.30 | 0.48 |
| Alpha | 1.85 | Stream Power (lb/ft s) | 1.14 | 5.45 | 0.74 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.15 | 2.90 | 7.04 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.32 | 0.40 | 2.03 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 300    Profile: 100 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.01 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.85 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 242.07 | 345.55 | 618.22 |
| E.G. Slope (ft/ft) | 0.002994 | Area (sq ft) | 242.07 | 345.55 | 618.22 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 464.04 | 1484.50 | 1015.46 |
| Top Width (ft) | 325.82 | Top Width (ft) | 65.86 | 44.77 | 215.19 |
| Vel Total (ft/s) | 2.46 | Avg. Vel. (ft/s) | 1.92 | 4.30 | 1.64 |
| Max Chl Dpth (ft) | 9.40 | Hydr. Depth (ft) | 3.68 | 7.72 | 2.87 |
| Conv. Total (cfs) | 54169.1 | Conv. (cfs) | 8480.7 | 27130.2 | 18558.3 |
| Length Wtd. (ft) | 90.67 | Wetted Per. (ft) | 66.86 | 48.58 | 215.30 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.68 | 1.33 | 0.54 |
| Alpha | 1.78 | Stream Power (lb/ft s) | 1.30 | 5.71 | 0.88 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.28 | 3.06 | 7.87 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.33 | 0.40 | 2.06 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 300    Profile: 200 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.43 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.26 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 269.38 | 363.99 | 707.62 |
| E.G. Slope (ft/ft) | 0.002911 | Area (sq ft) | 269.38 | 363.99 | 707.62 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 541.41 | 1596.17 | 1239.43 |
| Top Width (ft) | 330.52 | Top Width (ft) | 66.77 | 44.77 | 218.98 |
| Vel Total (ft/s) | 2.52 | Avg. Vel. (ft/s) | 2.01 | 4.39 | 1.75 |
| Max Chl Dpth (ft) | 9.81 | Hydr. Depth (ft) | 4.03 | 8.13 | 3.23 |
| Conv. Total (cfs) | 62593.9 | Conv. (cfs) | 10035.2 | 29585.5 | 22973.2 |
| Length Wtd. (ft) | 91.51 | Wetted Per. (ft) | 67.86 | 48.58 | 219.11 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.72 | 1.36 | 0.59 |
| Alpha | 1.71 | Stream Power (lb/ft s) | 1.45 | 5.97 | 1.03 |
| Frctn Loss (ft) | 0.13 | Cum Volume (acre-ft) | 1.42 | 3.22 | 8.72 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.34 | 0.40 | 2.09 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 300    Profile: 500 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.97 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.17 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.80 | Reach Len. (ft) | 78.67 | 75.00 | 115.54 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 305.89 | 388.25 | 827.65 |
| E.G. Slope (ft/ft) | 0.002823 | Area (sq ft) | 305.89 | 388.25 | 827.65 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 650.61 | 1750.35 | 1561.04 |
| Top Width (ft) | 336.70 | Top Width (ft) | 67.97 | 44.77 | 223.96 |
| Vel Total (ft/s) | 2.60 | Avg. Vel. (ft/s) | 2.13 | 4.51 | 1.89 |
| Max Chl Dpth (ft) | 10.35 | Hydr. Depth (ft) | 4.50 | 8.67 | 3.70 |
| Conv. Total (cfs) | 74572.9 | Conv. (cfs) | 12245.7 | 32945.1 | 29382.0 |
| Length Wtd. (ft) | 92.46 | Wetted Per. (ft) | 69.17 | 48.58 | 224.13 |
| Min Ch El (ft) | 45.45 | Shear (lb/sq ft) | 0.78 | 1.41 | 0.65 |
| Alpha | 1.64 | Stream Power (lb/ft s) | 1.66 | 6.35 | 1.23 |
| Frctn Loss (ft) | 0.14 | Cum Volume (acre-ft) | 1.60 | 3.44 | 9.85 |
| C & E Loss (ft) | 0.03 | Cum SA (acres) | 0.35 | 0.40 | 2.12 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 225 Profile: 10 Yr

| E.G. Elev (ft) | 53.45 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.40 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 203.71 | 453.52 | 735.61 |
| E.G. Slope (ft/ft) | 0.000683 | Area (sq ft) | 203.71 | 453.52 | 735.61 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 159.60 | 993.53 | 575.87 |
| Top Width (ft) | 381.89 | Top Width (ft) | 69.02 | 56.28 | 256.59 |
| Vel Total (ft/s) | 1.24 | Avg. Vel. (ft/s) | 0.78 | 2.19 | 0.78 |
| Max Chl Dpth (ft) | 9.30 | Hydr. Depth (ft) | 2.95 | 8.06 | 2.87 |
| Conv. Total (cfs) | 66180.3 | Conv. (cfs) | 6109.1 | 38028.9 | 22042.3 |
| Length Wtd. (ft) | 52.23 | Wetted Per. (ft) | 71.05 | 57.77 | 256.88 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.12 | 0.33 | 0.12 |
| Alpha | 1.96 | Stream Power (lb/ft s) | 0.10 | 0.73 | 0.10 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.52 | 1.87 | 3.68 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.18 | 0.31 | 1.33 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 225 Profile: 50 Yr

| E.G. Elev (ft) | 54.44 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.38 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 272.93 | 508.95 | 997.50 |
| E.G. Slope (ft/ft) | 0.000801 | Area (sq ft) | 272.93 | 508.95 | 997.50 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 274.53 | 1304.04 | 996.43 |
| Top Width (ft) | 399.87 | Top Width (ft) | 71.54 | 56.28 | 272.05 |
| Vel Total (ft/s) | 1.45 | Avg. Vel. (ft/s) | 1.01 | 2.56 | 1.00 |
| Max Chl Dpth (ft) | 10.28 | Hydr. Depth (ft) | 3.81 | 9.04 | 3.67 |
| Conv. Total (cfs) | 91004.6 | Conv. (cfs) | 9702.2 | 46086.9 | 35215.5 |
| Length Wtd. (ft) | 52.55 | Wetted Per. (ft) | 73.76 | 57.77 | 272.38 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.18 | 0.44 | 0.18 |
| Alpha | 1.82 | Stream Power (lb/ft s) | 0.19 | 1.13 | 0.18 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.71 | 2.18 | 5.02 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.20 | 0.31 | 1.39 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 225 Profile: 100 Yr

| E.G. Elev (ft) | 54.85 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.79 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 302.13 | 531.76 | 1108.36 |
| E.G. Slope (ft/ft) | 0.000834 | Area (sq ft) | 302.13 | 531.76 | 1108.36 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 328.64 | 1431.95 | 1203.41 |
| Top Width (ft) | 403.93 | Top Width (ft) | 72.58 | 56.28 | 275.07 |
| Vel Total (ft/s) | 1.53 | Avg. Vel. (ft/s) | 1.09 | 2.69 | 1.09 |
| Max Chl Dpth (ft) | 10.69 | Hydr. Depth (ft) | 4.16 | 9.45 | 4.03 |
| Conv. Total (cfs) | 102627.0 | Conv. (cfs) | 11379.1 | 49580.4 | 41667.5 |
| Length Wtd. (ft) | 52.66 | Wetted Per. (ft) | 74.87 | 57.77 | 275.42 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.21 | 0.48 | 0.21 |
| Alpha | 1.77 | Stream Power (lb/ft s) | 0.23 | 1.29 | 0.23 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.79 | 2.30 | 5.58 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.20 | 0.31 | 1.41 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 225 Profile: 200 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.26 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.20 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 331.90 | 554.68 | 1221.00 |
| E.G. Slope (ft/ft) | 0.000863 | Area (sq ft) | 331.90 | 554.68 | 1221.00 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 387.05 | 1562.40 | 1427.55 |
| Top Width (ft) | 408.01 | Top Width (ft) | 73.63 | 56.28 | 278.10 |
| Vel Total (ft/s) | 1.60 | Avg. Vel. (ft/s) | 1.17 | 2.82 | 1.17 |
| Max Chl Dpth (ft) | 11.10 | Hydr. Depth (ft) | 4.51 | 9.86 | 4.39 |
| Conv. Total (cfs) | 114972.4 | Conv. (cfs) | 13177.5 | 53193.0 | 48602.0 |
| Length Wtd. (ft) | 52.75 | Wetted Per. (ft) | 75.99 | 57.77 | 278.48 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.24 | 0.52 | 0.24 |
| Alpha | 1.72 | Stream Power (lb/ft s) | 0.27 | 1.46 | 0.28 |
| Frctn Loss (ft) | 0.04 | Cum Volume (acre-ft) | 0.87 | 2.43 | 6.16 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.21 | 0.31 | 1.43 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 225 Profile: 500 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 55.81 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.73 | Reach Len. (ft) | 61.29 | 50.00 | 55.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 371.83 | 584.92 | 1371.49 |
| E.G. Slope (ft/ft) | 0.000897 | Area (sq ft) | 371.83 | 584.92 | 1371.49 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 470.93 | 1740.84 | 1750.23 |
| Top Width (ft) | 413.39 | Top Width (ft) | 75.01 | 56.28 | 282.10 |
| Vel Total (ft/s) | 1.70 | Avg. Vel. (ft/s) | 1.27 | 2.98 | 1.28 |
| Max Chl Dpth (ft) | 11.63 | Hydr. Depth (ft) | 4.96 | 10.39 | 4.86 |
| Conv. Total (cfs) | 132260.8 | Conv. (cfs) | 15720.8 | 58113.2 | 58426.9 |
| Length Wtd. (ft) | 52.86 | Wetted Per. (ft) | 77.47 | 57.77 | 282.52 |
| Min Ch El (ft) | 44.10 | Shear (lb/sq ft) | 0.27 | 0.57 | 0.27 |
| Alpha | 1.66 | Stream Power (lb/ft s) | 0.34 | 1.69 | 0.35 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.99 | 2.60 | 6.93 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.22 | 0.31 | 1.45 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 175 Profile: 10 Yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 53.40 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.03 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.37 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 59.03 | 726.02 | 635.33 |
| E.G. Slope (ft/ft) | 0.000744 | Area (sq ft) | 59.03 | 726.02 | 635.33 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 44.61 | 1179.68 | 504.71 |
| Top Width (ft) | 400.84 | Top Width (ft) | 22.20 | 149.52 | 229.12 |
| Vel Total (ft/s) | 1.22 | Avg. Vel. (ft/s) | 0.76 | 1.62 | 0.79 |
| Max Chl Dpth (ft) | 9.70 | Hydr. Depth (ft) | 2.66 | 4.86 | 2.77 |
| Conv. Total (cfs) | 63406.6 | Conv. (cfs) | 1636.0 | 43261.8 | 18508.9 |
| Length Wtd. (ft) | 77.96 | Wetted Per. (ft) | 23.18 | 154.37 | 231.43 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.12 | 0.22 | 0.13 |
| Alpha | 1.35 | Stream Power (lb/ft s) | 0.09 | 0.35 | 0.10 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 0.34 | 1.19 | 2.81 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.12 | 0.19 | 1.03 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 175    Profile: 50 Yr

| E.G. Elev (ft) | 54.40 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.35 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 81.86 | 872.82 | 867.54 |
| E.G. Slope (ft/ft) | 0.000794 | Area (sq ft) | 81.86 | 872.82 | 867.54 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 74.61 | 1657.16 | 843.23 |
| Top Width (ft) | 416.81 | Top Width (ft) | 24.30 | 149.52 | 242.98 |
| Vel Total (ft/s) | 1.41 | Avg. Vel. (ft/s) | 0.91 | 1.90 | 0.97 |
| Max Chl Dpth (ft) | 10.68 | Hydr. Depth (ft) | 3.37 | 5.84 | 3.57 |
| Conv. Total (cfs) | 91370.8 | Conv. (cfs) | 2647.5 | 58802.3 | 29921.1 |
| Length Wtd. (ft) | 79.83 | Wetted Per. (ft) | 25.49 | 154.37 | 245.33 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.16 | 0.28 | 0.18 |
| Alpha | 1.33 | Stream Power (lb/ft s) | 0.15 | 0.53 | 0.17 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 0.46 | 1.38 | 3.84 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.13 | 0.19 | 1.07 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 175    Profile: 100 Yr

| E.G. Elev (ft) | 54.80 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.76 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 91.86 | 933.25 | 966.69 |
| E.G. Slope (ft/ft) | 0.000808 | Area (sq ft) | 91.86 | 933.25 | 966.69 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 88.99 | 1868.99 | 1006.02 |
| Top Width (ft) | 422.32 | Top Width (ft) | 25.17 | 149.52 | 247.63 |
| Vel Total (ft/s) | 1.49 | Avg. Vel. (ft/s) | 0.97 | 2.00 | 1.04 |
| Max Chl Dpth (ft) | 11.09 | Hydr. Depth (ft) | 3.65 | 6.24 | 3.90 |
| Conv. Total (cfs) | 104262.0 | Conv. (cfs) | 3130.4 | 65743.7 | 35387.9 |
| Length Wtd. (ft) | 80.45 | Wetted Per. (ft) | 26.45 | 154.37 | 249.99 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.18 | 0.31 | 0.20 |
| Alpha | 1.32 | Stream Power (lb/ft s) | 0.17 | 0.61 | 0.20 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | 0.51 | 1.46 | 4.27 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.13 | 0.19 | 1.08 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 175    Profile: 200 Yr

| E.G. Elev (ft) | 55.21 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.16 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 102.26 | 994.00 | 1068.26 |
| E.G. Slope (ft/ft) | 0.000819 | Area (sq ft) | 102.26 | 994.00 | 1068.26 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 104.64 | 2090.56 | 1181.80 |
| Top Width (ft) | 427.86 | Top Width (ft) | 26.03 | 149.52 | 252.31 |
| Vel Total (ft/s) | 1.56 | Avg. Vel. (ft/s) | 1.02 | 2.10 | 1.11 |
| Max Chl Dpth (ft) | 11.49 | Hydr. Depth (ft) | 3.93 | 6.65 | 4.23 |
| Conv. Total (cfs) | 117970.3 | Conv. (cfs) | 3655.5 | 73030.4 | 41284.5 |
| Length Wtd. (ft) | 80.99 | Wetted Per. (ft) | 27.41 | 154.37 | 254.69 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.19 | 0.33 | 0.21 |
| Alpha | 1.31 | Stream Power (lb/ft s) | 0.20 | 0.69 | 0.24 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 0.57 | 1.54 | 4.71 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.14 | 0.19 | 1.09 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 175    Profile: 500 Yr

| E.G. Elev (ft) | 55.76 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.70 | Reach Len. (ft) | 104.66 | 65.00 | 97.23 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 116.53 | 1074.17 | 1205.18 |
| E.G. Slope (ft/ft) | 0.000834 | Area (sq ft) | 116.53 | 1074.17 | 1205.18 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 127.35 | 2400.11 | 1434.55 |
| Top Width (ft) | 435.17 | Top Width (ft) | 27.18 | 149.52 | 258.47 |
| Vel Total (ft/s) | 1.65 | Avg. Vel. (ft/s) | 1.09 | 2.23 | 1.19 |
| Max Chl Dpth (ft) | 12.03 | Hydr. Depth (ft) | 4.29 | 7.18 | 4.66 |
| Conv. Total (cfs) | 137190.9 | Conv. (cfs) | 4409.6 | 83107.7 | 49673.7 |
| Length Wtd. (ft) | 81.59 | Wetted Per. (ft) | 28.67 | 154.37 | 260.87 |
| Min Ch El (ft) | 43.67 | Shear (lb/sq ft) | 0.21 | 0.36 | 0.24 |
| Alpha | 1.31 | Stream Power (lb/ft s) | 0.23 | 0.81 | 0.29 |
| Frctn Loss (ft) | 0.08 | Cum Volume (acre-ft) | 0.64 | 1.65 | 5.30 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.14 | 0.19 | 1.11 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 110    Profile: 10 Yr

| E.G. Elev (ft) | 53.34 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.28 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 44.93 | 355.58 | 901.33 |
| E.G. Slope (ft/ft) | 0.000944 | Area (sq ft) | 44.93 | 355.58 | 901.33 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 35.90 | 906.83 | 786.27 |
| Top Width (ft) | 400.45 | Top Width (ft) | 16.87 | 45.26 | 338.32 |
| Vel Total (ft/s) | 1.33 | Avg. Vel. (ft/s) | 0.80 | 2.55 | 0.87 |
| Max Chl Dpth (ft) | 9.11 | Hydr. Depth (ft) | 2.66 | 7.86 | 2.66 |
| Conv. Total (cfs) | 56278.3 | Conv. (cfs) | 1168.5 | 29516.9 | 25592.9 |
| Length Wtd. (ft) | 55.10 | Wetted Per. (ft) | 19.40 | 45.98 | 341.21 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.14 | 0.46 | 0.16 |
| Alpha | 2.14 | Stream Power (lb/ft s) | 0.11 | 1.16 | 0.14 |
| Frctn Loss (ft) | 0.05 | Cum Volume (acre-ft) | 0.21 | 0.39 | 1.10 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.07 | 0.05 | 0.39 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 110    Profile: 50 Yr

| E.G. Elev (ft) | 54.32 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.25 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 62.50 | 399.72 | 1239.27 |
| E.G. Slope (ft/ft) | 0.001035 | Area (sq ft) | 62.50 | 399.72 | 1239.27 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 60.11 | 1153.98 | 1360.91 |
| Top Width (ft) | 417.37 | Top Width (ft) | 19.16 | 45.26 | 352.95 |
| Vel Total (ft/s) | 1.51 | Avg. Vel. (ft/s) | 0.96 | 2.89 | 1.10 |
| Max Chl Dpth (ft) | 10.08 | Hydr. Depth (ft) | 3.26 | 8.83 | 3.51 |
| Conv. Total (cfs) | 80049.2 | Conv. (cfs) | 1868.7 | 35873.9 | 42306.6 |
| Length Wtd. (ft) | 54.48 | Wetted Per. (ft) | 21.90 | 45.98 | 355.87 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.18 | 0.56 | 0.22 |
| Alpha | 1.92 | Stream Power (lb/ft s) | 0.18 | 1.62 | 0.25 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 0.29 | 0.43 | 1.49 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.08 | 0.05 | 0.40 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 110 Profile: 100 Yr

| E.G. Elev (ft) | 54.73 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.07 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.66 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 70.42 | 417.97 | 1382.25 |
| E.G. Slope (ft/ft) | 0.001054 | Area (sq ft) | 70.42 | 417.97 | 1382.25 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 71.78 | 1254.79 | 1637.43 |
| Top Width (ft) | 421.71 | Top Width (ft) | 20.11 | 45.26 | 356.34 |
| Vel Total (ft/s) | 1.58 | Avg. Vel. (ft/s) | 1.02 | 3.00 | 1.18 |
| Max Chl Dpth (ft) | 10.49 | Hydr. Depth (ft) | 3.50 | 9.23 | 3.88 |
| Conv. Total (cfs) | 91284.7 | Conv. (cfs) | 2210.7 | 38644.7 | 50429.3 |
| Length Wtd. (ft) | 54.29 | Wetted Per. (ft) | 22.93 | 45.98 | 359.28 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.20 | 0.60 | 0.25 |
| Alpha | 1.84 | Stream Power (lb/ft s) | 0.21 | 1.80 | 0.30 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 0.32 | 0.45 | 1.65 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.08 | 0.05 | 0.41 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 110 Profile: 200 Yr

| E.G. Elev (ft) | 55.14 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.08 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.06 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 78.77 | 436.33 | 1527.50 |
| E.G. Slope (ft/ft) | 0.001069 | Area (sq ft) | 78.77 | 436.33 | 1527.50 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 84.59 | 1357.27 | 1935.14 |
| Top Width (ft) | 426.07 | Top Width (ft) | 21.07 | 45.26 | 359.75 |
| Vel Total (ft/s) | 1.65 | Avg. Vel. (ft/s) | 1.07 | 3.11 | 1.27 |
| Max Chl Dpth (ft) | 10.89 | Hydr. Depth (ft) | 3.74 | 9.64 | 4.25 |
| Conv. Total (cfs) | 103293.9 | Conv. (cfs) | 2587.4 | 41515.4 | 59191.1 |
| Length Wtd. (ft) | 54.12 | Wetted Per. (ft) | 23.97 | 45.98 | 362.71 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.22 | 0.63 | 0.28 |
| Alpha | 1.77 | Stream Power (lb/ft s) | 0.24 | 1.97 | 0.36 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 0.35 | 0.47 | 1.82 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.08 | 0.05 | 0.41 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 110 Profile: 500 Yr

| E.G. Elev (ft) | 55.68 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.08 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.60 | Reach Len. (ft) | 75.08 | 60.00 | 48.71 |
| Crit W.S. (ft) |  | Flow Area (sq ft) | 90.39 | 460.56 | 1721.29 |
| E.G. Slope (ft/ft) | 0.001087 | Area (sq ft) | 90.39 | 460.56 | 1721.29 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 103.36 | 1497.43 | 2361.22 |
| Top Width (ft) | 431.83 | Top Width (ft) | 22.33 | 45.26 | 364.24 |
| Vel Total (ft/s) | 1.74 | Avg. Vel. (ft/s) | 1.14 | 3.25 | 1.37 |
| Max Chl Dpth (ft) | 11.43 | Hydr. Depth (ft) | 4.05 | 10.18 | 4.73 |
| Conv. Total (cfs) | 120197.5 | Conv. (cfs) | 3135.7 | 45428.3 | 71633.6 |
| Length Wtd. (ft) | 53.94 | Wetted Per. (ft) | 25.34 | 45.98 | 367.24 |
| Min Ch El (ft) | 44.17 | Shear (lb/sq ft) | 0.24 | 0.68 | 0.32 |
| Alpha | 1.69 | Stream Power (lb/ft s) | 0.28 | 2.21 | 0.44 |
| Frctn Loss (ft) | 0.06 | Cum Volume (acre-ft) | 0.39 | 0.50 | 2.04 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 0.09 | 0.05 | 0.41 |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 50 Profile: 10 Yr

| E.G. Elev (ft) | 53.28 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 53.24 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 51.05 | Flow Area (sq ft) | 201.24 | 203.92 | 1063.74 |
| E.G. Slope (ft/ft) | 0.001000 | Area (sq ft) | 201.24 | 203.92 | 1063.74 |
| Q Total (cfs) | 1729.00 | Flow (cfs) | 192.78 | 515.60 | 1020.61 |
| Top Width (ft) | 458.53 | Top Width (ft) | 67.71 | 26.62 | 364.20 |
| Vel Total (ft/s) | 1.18 | Avg. Vel. (ft/s) | 0.96 | 2.53 | 0.96 |
| Max Chl Dpth (ft) | 8.61 | Hydr. Depth (ft) | 2.97 | 7.66 | 2.92 |
| Conv. Total (cfs) | 54673.5 | Conv. (cfs) | 6096.1 | 16304.1 | 32273.3 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 69.14 | 27.90 | 364.60 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.18 | 0.46 | 0.18 |
| Alpha | 1.84 | Stream Power (lb/ft s) | 0.17 | 1.15 | 0.17 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 50 Profile: 50 Yr

| E.G. Elev (ft) | 54.26 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.04 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.21 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 51.44 | Flow Area (sq ft) | 268.61 | 229.93 | 1421.53 |
| E.G. Slope (ft/ft) | 0.001001 | Area (sq ft) | 268.61 | 229.93 | 1421.53 |
| Q Total (cfs) | 2575.00 | Flow (cfs) | 303.26 | 629.96 | 1641.78 |
| Top Width (ft) | 465.71 | Top Width (ft) | 70.55 | 26.62 | 368.54 |
| Vel Total (ft/s) | 1.34 | Avg. Vel. (ft/s) | 1.13 | 2.74 | 1.15 |
| Max Chl Dpth (ft) | 9.58 | Hydr. Depth (ft) | 3.81 | 8.64 | 3.86 |
| Conv. Total (cfs) | 81406.3 | Conv. (cfs) | 9587.2 | 19915.8 | 51903.4 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 72.15 | 27.90 | 369.05 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.23 | 0.51 | 0.24 |
| Alpha | 1.58 | Stream Power (lb/ft s) | 0.26 | 1.41 | 0.28 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Plan: Prop 65 ft 3 Mile River 3 Mile River Bas RS: 50 Profile: 100 Yr

| E.G. Elev (ft) | 54.66 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 54.62 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 51.56 | Flow Area (sq ft) | 297.46 | 240.68 | 1570.82 |
| E.G. Slope (ft/ft) | 0.001001 | Area (sq ft) | 297.46 | 240.68 | 1570.82 |
| Q Total (cfs) | 2964.00 | Flow (cfs) | 353.33 | 680.07 | 1930.60 |
| Top Width (ft) | 470.25 | Top Width (ft) | 72.44 | 26.62 | 371.19 |
| Vel Total (ft/s) | 1.41 | Avg. Vel. (ft/s) | 1.19 | 2.83 | 1.23 |
| Max Chl Dpth (ft) | 9.99 | Hydr. Depth (ft) | 4.11 | 9.04 | 4.23 |
| Conv. Total (cfs) | 93665.0 | Conv. (cfs) | 11165.5 | 21491.0 | 61008.5 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 74.09 | 27.90 | 371.73 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.25 | 0.54 | 0.26 |
| Alpha | 1.51 | Stream Power (lb/ft s) | 0.30 | 1.52 | 0.32 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 50    Profile: 200 Yr

| E.G. Elev (ft) | 55.07 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.02 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 51.71 | Flow Area (sq ft) | 327.28 | 251.49 | 1722.15 |
| E.G. Slope (ft/ft) | 0.001000 | Area (sq ft) | 327.28 | 251.49 | 1722.15 |
| Q Total (cfs) | 3377.00 | Flow (cfs) | 407.00 | 731.42 | 2238.59 |
| Top Width (ft) | 474.82 | Top Width (ft) | 74.35 | 26.62 | 373.85 |
| Vel Total (ft/s) | 1.47 | Avg. Vel. (ft/s) | 1.24 | 2.91 | 1.30 |
| Max Chl Dpth (ft) | 10.39 | Hydr. Depth (ft) | 4.40 | 9.45 | 4.61 |
| Conv. Total (cfs) | 106766.4 | Conv. (cfs) | 12867.5 | 23124.4 | 70774.6 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 76.04 | 27.90 | 374.42 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.27 | 0.56 | 0.29 |
| Alpha | 1.46 | Stream Power (lb/ft s) | 0.33 | 1.64 | 0.37 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 50    Profile: 500 Yr

| E.G. Elev (ft) | 55.61 | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.100 | 0.070 | 0.100 |
| W.S. Elev (ft) | 55.56 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 51.83 | Flow Area (sq ft) | 367.81 | 265.76 | 1923.48 |
| E.G. Slope (ft/ft) | 0.001001 | Area (sq ft) | 367.81 | 265.76 | 1923.48 |
| Q Total (cfs) | 3962.00 | Flow (cfs) | 483.79 | 802.27 | 2675.94 |
| Top Width (ft) | 480.85 | Top Width (ft) | 76.87 | 26.62 | 377.36 |
| Vel Total (ft/s) | 1.55 | Avg. Vel. (ft/s) | 1.32 | 3.02 | 1.39 |
| Max Chl Dpth (ft) | 10.93 | Hydr. Depth (ft) | 4.78 | 9.98 | 5.10 |
| Conv. Total (cfs) | 125200.8 | Conv. (cfs) | 15288.1 | 25352.1 | 84560.8 |
| Length Wtd. (ft) | | Wetted Per. (ft) | 78.62 | 27.90 | 377.97 |
| Min Ch El (ft) | 44.63 | Shear (lb/sq ft) | 0.29 | 0.60 | 0.32 |
| Alpha | 1.40 | Stream Power (lb/ft s) | 0.38 | 1.80 | 0.44 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503        Profile: 10 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 54.19 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 53.93 | E.G. Elev (ft) | 54.09 | 53.94 |
| Q Total (cfs) | 1729.00 | W.S. Elev (ft) | 53.69 | 53.78 |
| Q Bridge (cfs) | 1729.00 | Crit W.S. (ft) | 48.69 | 44.46 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 10.52 | 14.46 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 4.20 | 3.07 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 411.62 | 563.87 |
| Weir Submerg | | Froude # Chl | 0.31 | 0.17 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 2034.19 | 3656.17 |
| Min El Weir Flow (ft) | 65.20 | Hydr Depth (ft) | 6.71 | 9.16 |
| Min El Prs (ft) | 60.52 | W.P. Total (ft) | 69.15 | 76.97 |
| Delta EG (ft) | 0.31 | Conv. Total (cfs) | 30669.4 | 47592.0 |
| Delta WS (ft) | 0.14 | Top Width (ft) | 61.37 | 61.56 |
| BR Open Area (sq ft) | 837.29 | Frctn Loss (ft) | 0.03 | 0.02 |
| BR Open Vel (ft/s) | 4.20 | C & E Loss (ft) | 0.12 | 0.03 |
| BR Sluice Coef | | Shear Total (lb/sq ft) | 1.18 | 0.60 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 4.96 | 1.85 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503        Profile: 50 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 55.48 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 55.05 | E.G. Elev (ft) | 55.30 | 55.05 |
| Q Total (cfs) | 2575.00 | W.S. Elev (ft) | 54.60 | 54.77 |
| Q Bridge (cfs) | 2575.00 | Crit W.S. (ft) | 49.99 | 45.77 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 11.43 | 15.45 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 5.49 | 4.11 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 468.95 | 625.92 |
| Weir Submerg | | Froude # Chl | 0.39 | 0.22 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 2691.11 | 4413.57 |
| Min El Weir Flow (ft) | 65.20 | Hydr Depth (ft) | 7.21 | 9.63 |
| Min El Prs (ft) | 60.52 | W.P. Total (ft) | 73.99 | 81.83 |
| Delta EG (ft) | 0.52 | Conv. Total (cfs) | 36300.6 | 54863.4 |
| Delta WS (ft) | 0.26 | Top Width (ft) | 65.00 | 65.00 |
| BR Open Area (sq ft) | 837.29 | Frctn Loss (ft) | 0.04 | 0.03 |
| BR Open Vel (ft/s) | 5.49 | C & E Loss (ft) | 0.21 | 0.06 |
| BR Sluice Coef | | Shear Total (lb/sq ft) | 1.99 | 1.05 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 10.93 | 4.33 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503        Profile: 100 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 56.02 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 55.51 | E.G. Elev (ft) | 55.81 | 55.51 |
| Q Total (cfs) | 2964.00 | W.S. Elev (ft) | 54.97 | 55.16 |
| Q Bridge (cfs) | 2964.00 | Crit W.S. (ft) | 50.63 | 46.31 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 11.80 | 15.84 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 6.01 | 4.55 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 492.78 | 651.73 |
| Weir Submerg | | Froude # Chl | 0.42 | 0.24 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 3002.12 | 4761.01 |
| Min El Weir Flow (ft) | 65.20 | Hydr Depth (ft) | 7.58 | 10.03 |
| Min El Prs (ft) | 60.52 | W.P. Total (ft) | 74.72 | 82.62 |
| Delta EG (ft) | 0.62 | Conv. Total (cfs) | 38787.2 | 57981.4 |
| Delta WS (ft) | 0.31 | Top Width (ft) | 65.00 | 65.00 |
| BR Open Area (sq ft) | 837.29 | Frctn Loss (ft) | 0.05 | 0.04 |
| BR Open Vel (ft/s) | 6.01 | C & E Loss (ft) | 0.24 | 0.07 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503        Profile: 100 Yr (Continued)

| | | | | |
|---|---|---|---|---|
| BR Sluice Coef | | Shear Total (lb/sq ft) | 2.40 | 1.29 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 14.46 | 5.85 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503        Profile: 200 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 56.57 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 55.98 | E.G. Elev (ft) | 56.32 | 55.98 |
| Q Total (cfs) | 3377.00 | W.S. Elev (ft) | 55.33 | 55.55 |
| Q Bridge (cfs) | 3377.00 | Crit W.S. (ft) | 51.28 | 46.86 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 12.16 | 16.23 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 6.54 | 4.99 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 516.08 | 677.22 |
| Weir Submerg | | Froude # Chl | 0.46 | 0.27 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 3338.90 | 5130.71 |
| Min El Weir Flow (ft) | 65.20 | Hydr Depth (ft) | 7.94 | 10.42 |
| Min El Prs (ft) | 60.52 | W.P. Total (ft) | 75.44 | 83.41 |
| Delta EG (ft) | 0.73 | Conv. Total (cfs) | 41280.8 | 61118.8 |
| Delta WS (ft) | 0.38 | Top Width (ft) | 65.00 | 65.00 |
| BR Open Area (sq ft) | 837.29 | Frctn Loss (ft) | 0.06 | 0.05 |
| BR Open Vel (ft/s) | 6.54 | C & E Loss (ft) | 0.29 | 0.09 |
| BR Sluice Coef | | Shear Total (lb/sq ft) | 2.86 | 1.55 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 18.70 | 7.72 |

Plan: Prop 65 ft    3 Mile River    3 Mile River Bas  RS: 503        Profile: 500 Yr

| | | | | |
|---|---|---|---|---|
| E.G. US. (ft) | 57.32 | Element | Inside BR US | Inside BR DS |
| W.S. US. (ft) | 56.60 | E.G. Elev (ft) | 57.01 | 56.60 |
| Q Total (cfs) | 3962.00 | W.S. Elev (ft) | 55.79 | 56.06 |
| Q Bridge (cfs) | 3962.00 | Crit W.S. (ft) | 52.06 | 47.56 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 12.62 | 16.74 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 7.26 | 5.58 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 545.87 | 710.25 |
| Weir Submerg | | Froude # Chl | 0.50 | 0.29 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 3825.43 | 5654.34 |
| Min El Weir Flow (ft) | 65.20 | Hydr Depth (ft) | 8.40 | 10.93 |
| Min El Prs (ft) | 60.52 | W.P. Total (ft) | 76.36 | 84.42 |
| Delta EG (ft) | 0.89 | Conv. Total (cfs) | 44553.1 | 65268.5 |
| Delta WS (ft) | 0.48 | Top Width (ft) | 65.00 | 65.00 |
| BR Open Area (sq ft) | 837.29 | Frctn Loss (ft) | 0.07 | 0.06 |
| BR Open Vel (ft/s) | 7.26 | C & E Loss (ft) | 0.35 | 0.11 |
| BR Sluice Coef | | Shear Total (lb/sq ft) | 3.53 | 1.94 |
| BR Sel Method | Energy only | Power Total (lb/ft s) | 25.62 | 10.80 |

# APPENDIX G:

## SCOUR / STABILITY ANALYSIS

Existing and Proposed NCHRP Abutment Scour Calculations for 200-Year Design Return Frequency

Existing and Proposed NCHRP Abutment Scour Calculations for 500-Year Check Return Frequency

200-YR

| | | | |
|---|---|---|---|
| Project: | Attleboro Secondary Line over Three Mile River | | |
| Job No.: | E2X83500 | Location: | Norton, MA |
| Calced By: | JRB | Date: | 7/22/2020 |
| Checked By: | AMS | Date: | 7/26/2020 |

*(Type input values into the shaded boxes)*

## NCHRP 24-20 Abutment Scour Calculations

200-YR (Design Storm Event)

**For Attleboro Secondary Line over Three Mile River**

**Objective:**

Calculate total **abutment scour** experienced by the: **Existing Bridge Abutment**

**Method:**

Use NCHRP 24-20 Abutment Scour Approach found in HEC-18 and the HEC-RAS model to solve for total scour depth for the 200-year storm. See Chapter 8 of HEC-18.

**Assumptions:**

If the projected length of embankment is 75% or greater than the width of the floodplain then live-bed scour caluclation is used. If the projected length of embankment is less than 75% of the floodplain width then clear-water scour caluclation is used.

Existing bridge abutment is adjacent to stream; Therefore, length of emankment and floodplain are equal.

**Calculations:**

Determine Scour Condition for Abutment

$L =$ 190.8 Length of Embankment

$B_f =$ 199.0 Width of Floodplain

$L/B_f =$ 0.96

L/Bf >= 0.75 **Live-Bed Scour**

Calculate Live-Bed Scour

$$\boxed{y_c = y_1 \left(\frac{q_{2c}}{q_1}\right)^{6/7}}$$

$y_1 =$ 12.79 Upstream flow depth, ft River Section: 535

$V =$ 6.58 Upstream Velocity, ft/s

$q_1 =$ 84.2 Upstream unit discharge, $ft^2/s$

$Q =$ 3377.0 Total discharge in bridge opening, cfs

$W =$ 46.8 Width of Bridge Opening, ft

$q_{2c} =$ 72.2 Unit discharge in constricted opening accounting for non-uniform flow distribution, $ft^2/s$

$y_c =$ 11.2 Flow depth including live-bed contraction scour, ft

**200-YR**

| | | | |
|---|---|---|---|
| Project: | Attleboro Secondary Line over Three Mile River | | |
| Job No.: | E2X83500 | Location: | Norton, MA |
| Calced By: | JRB | Date: | 7/22/2020 |
| Checked By: | AMS | Date: | 7/26/2020 |

*(Type input values into the shaded boxes)*

## NCHRP 24-20 Abutment Scour Calculations

200-YR (Design Storm Event)

$$y_{max} = \alpha_A y_c$$

$$y_s = y_{max} - y_0$$

| | | |
|---|---|---|
| $q_{2c}/q_1$ = | 0.9 | |
| $\alpha_A$ = | 1.20 | Amplication factor for live-bed conditions, from table |
| $y_c$ = | 11.2 | Flow depth including live-bed contraction scour, ft |
| $y_{max}$ = | 13.5 | Maximum flow depth resulting from abutment scour, ft |
| $y_0$ = | 8.39 | Bridge channel flow depth prior to scour, ft |
| | | |
| $y_s$ = | 5.1 | Abutment Scour Depth |

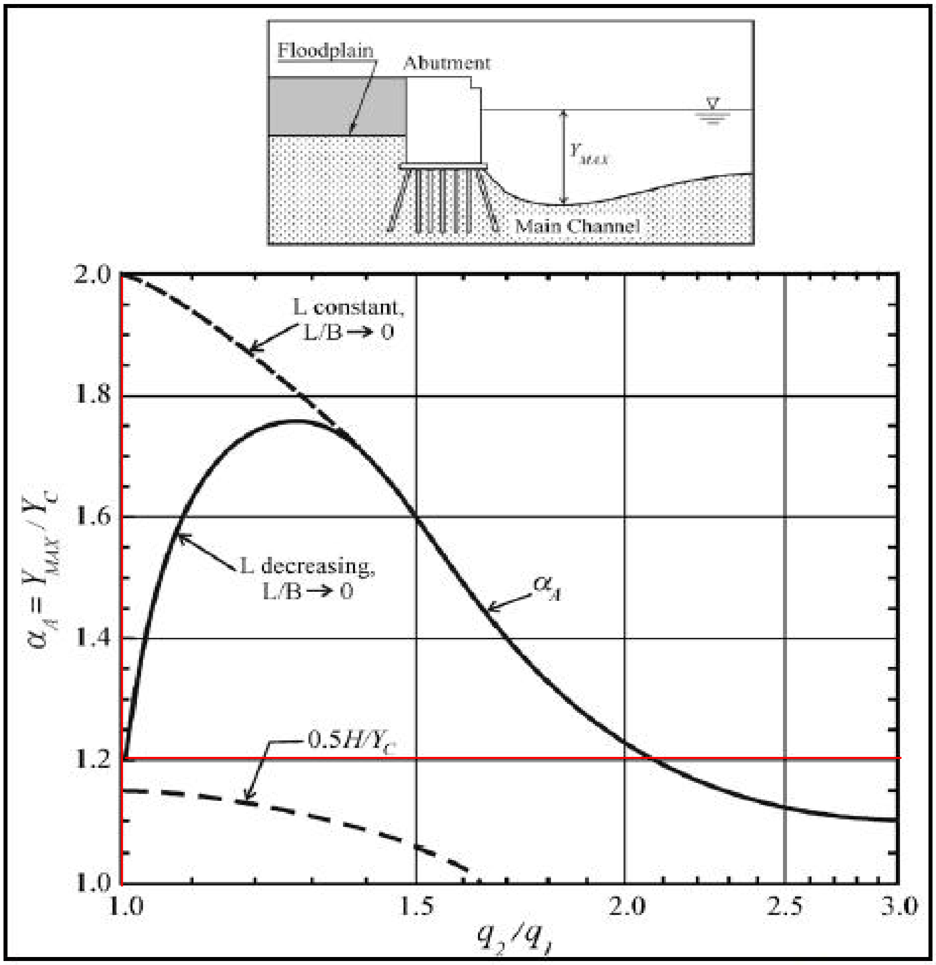


Figure 8.10. Scour amplification factor for wingwall abutments and live-bed conditions (NCHRP 2010b).

| 500-YR | | | | |
|---|---|---|---|---|
| | Project: | Attleboro Secondary Line over Three Mile River | | |
| | Job No.: | E2X83500 | Location: | Norton, MA |
| | Calced By: | JRB | Date: | 7/22/2020 |
| *(Type input values into the shaded boxes)* | Checked By: | AMS | Date: | 7/26/2020 |

## NCHRP 24-20 Abutment Scour Calculations

500-YR (Check Storm Event)

**For Attleboro Secondary Line over Three Mile River**

**Objective:**

Calculate total **abutment scour** experienced by the: **Existing Bridge Abutment**

**Method:**

Use NCHRP 24-20 Abutment Scour Approach found in HEC-18 and the HEC-RAS model to solve for total scour depth for the 500-year storm. See Chapter 8 of HEC-18.

**Assumptions:**

If the projected length of embankment is 75% or greater than the width of the floodplain then live-bed scour caluclation is used. If the projected length of embankment is less than 75% of the floodplain width then clear-water scour caluclation is used.

Existing bridge abutment is adjacent to stream; Therefore, length of emankment and floodplain are equal.

**Calculations:**

Determine Scour Condition for Abutment

| | | |
|---|---|---|
| $L$ = | 190.8 | Length of Embankment |
| $B_f$ = | 199.0 | Width of Floodplain |
| $L/B_f$ = | 0.96 | |

L/Bf >= 0.75 **Live-Bed Scour**

Calculate Live-Bed Scour

$$y_c = y_1 \left(\frac{q_{2c}}{q_1}\right)^{6/7}$$

| | | | |
|---|---|---|---|
| $y_1$ = | 13.56 | Upstream flow depth, ft | River Section: 535 |
| $V$ = | 7.24 | Upstream Velocity, ft/s | |
| $q_1$ = | 98.2 | Upstream unit discharge, $ft^2/s$ | |
| $Q$ = | 3962.0 | Total discharge in bridge opening, cfs | |
| $W$ = | 46.8 | Width of Bridge Opening, ft | |
| $q_{2c}$ = | 84.7 | Unit discharge in constricted opening accounting for non-uniform flow distribution, $ft^2/s$ | |

$y_c$ = 12.0 Flow depth including live-bed contraction scour, ft

# 500-YR

| | | | |
|---|---|---|---|
| Project: | Attleboro Secondary Line over Three Mile River | | |
| Job No.: | E2X83500 | Location: | Norton, MA |
| Calced By: | JRB | Date: | 7/22/2020 |
| Checked By: | AMS | Date: | 7/26/2020 |

*(Type input values into the shaded boxes)*

## NCHRP 24-20 Abutment Scour Calculations

500-YR (Check Storm Event)

$$y_{max} = \alpha_A y_c$$

$$y_s = y_{max} - y_0$$

| | | |
|---|---|---|
| $q_{2c}/q_1$ = | 0.9 | |
| $\alpha_A$ = | 1.20 | Amplication factor for live-bed conditions, from table |
| $y_c$ = | 12.0 | Flow depth including live-bed contraction scour, ft |
| $y_{max}$ = | 14.3 | Maximum flow depth resulting from abutment scour, ft |
| $y_0$ = | 8.78 | Bridge channel flow depth prior to scour, ft |
| | | |
| $y_s$ = | 5.6 | Abutment Scour Depth |

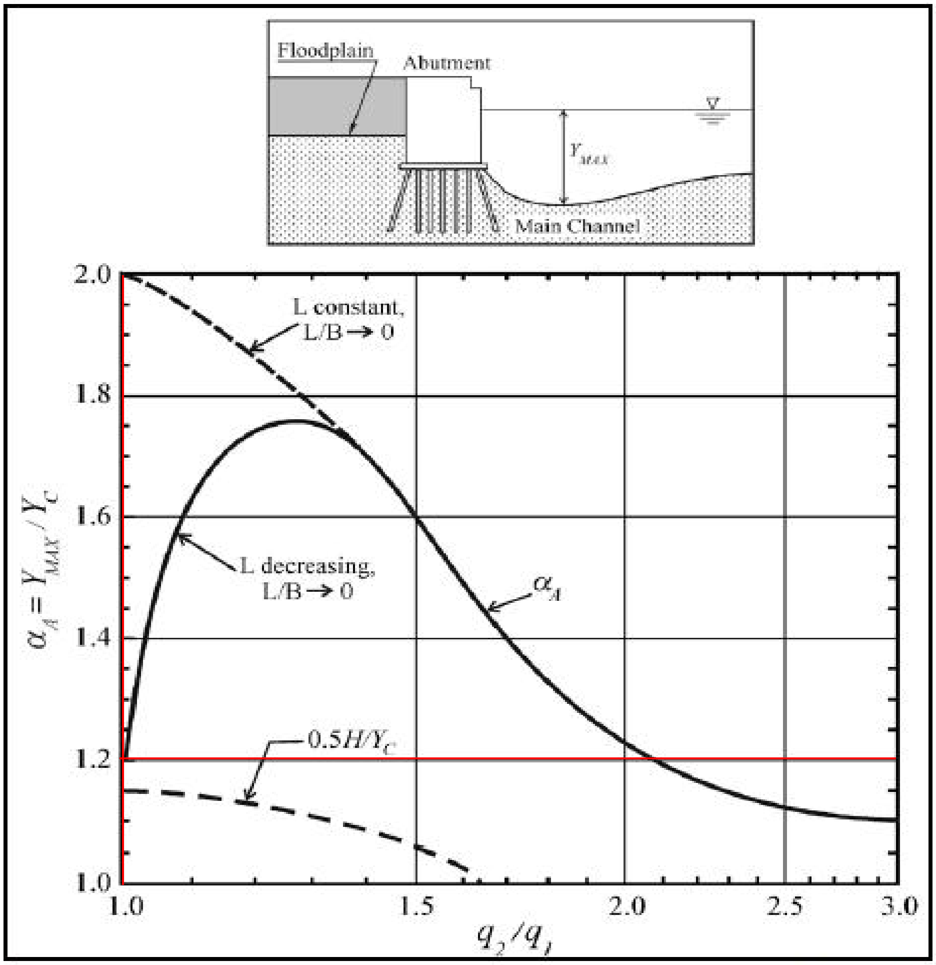


Figure 8.10. Scour amplification factor for wingwall abutments and live-bed conditions (NCHRP 2010b).

200-YR

| | | | |
|---|---|---|---|
| Project: | Attleboro Secondary Line over Three Mile River | | |
| Job No.: | E2X83500 | Location: | Norton, MA |
| Calced By: | JRB | Date: | 9/14/2020 |
| Checked By: | AMS | Date: | 10/4/2020 |

*(Type input values into the shaded boxes)*

## NCHRP 24-20 Abutment Scour Calculations

200-YR (Design Storm Event)

For Attleboro Secondary Line over Three Mile River

**Objective:**

Calculate total **abutment scour** experienced by the: Proposed Bridge Abutment

**Method:**

Use NCHRP 24-20 Abutment Scour Approach found in HEC-18 and the HEC-RAS model to solve for total scour depth for the 100-year storm. See Chapter 8 of HEC-18.

**Assumptions:**

If the projected length of embankment is 75% or greater than the width of the floodplain then live-bed scour caluclation is used. If the projected length of embankment is less than 75% of the floodplain width then clear-water scour caluclation is used.

**Calculations:**

Determine Scour Condition for Abutment

$L$ = 183.2 Length of Embankment
$B_f$ = 199.0 Width of Floodplain
$L/B_f$ = 0.92

L/Bf >= 0.75 Live-Bed Scour

Calculate Live-Bed Scour

$$y_c = y_1 \left(\frac{q_{2c}}{q_1}\right)^{6/7}$$

$y_1$ = 12.30 Upstream flow depth, ft River Section: 535
$V$ = 5.41 Upstream Velocity Total, ft/s
$q_1$ = 66.5 Upstream unit discharge, $ft^2/s$
$Q$ = 3377.0 Total discharge in bridge opening, cfs
$W$ = 65.00 Width of Bridge Opening, ft
$q_{2c}$ = 52.0 Unit discharge in constricted opening accounting for non-uniform flow distribution, $ft^2/s$

$y_c$ = 9.9 Flow depth including live-bed contraction scour, ft

200-YR

*(Type input values into the shaded boxes)*

| | | | |
|---|---|---|---|
| Project: | Attleboro Secondary Line over Three Mile River | | |
| Job No.: | E2X83500 | Location: | Norton, MA |
| Calced By: | JRB | Date: | 9/14/2020 |
| Checked By: | AMS | Date: | 10/4/2020 |

## NCHRP 24-20 Abutment Scour Calculations

200-YR (Design Storm Event)

$$y_{max} = \alpha_A y_c$$

$$y_s = y_{max} - y_0$$

| | | |
|---|---|---|
| $q_{2c}/q_1$ = | 0.8 | |
| $\alpha_A$ = | 1.20 | Amplication factor for live-bed conditions, from table |
| $y_c$ = | 9.9 | Flow depth including live-bed contraction scour, ft |
| $y_{max}$ = | 11.9 | Maximum flow depth resulting from abutment scour, ft |
| $y_0$ = | 7.94 | Bridge channel flow depth prior to scour, ft |

$y_s$ = 4.0 Abutment Scour Depth

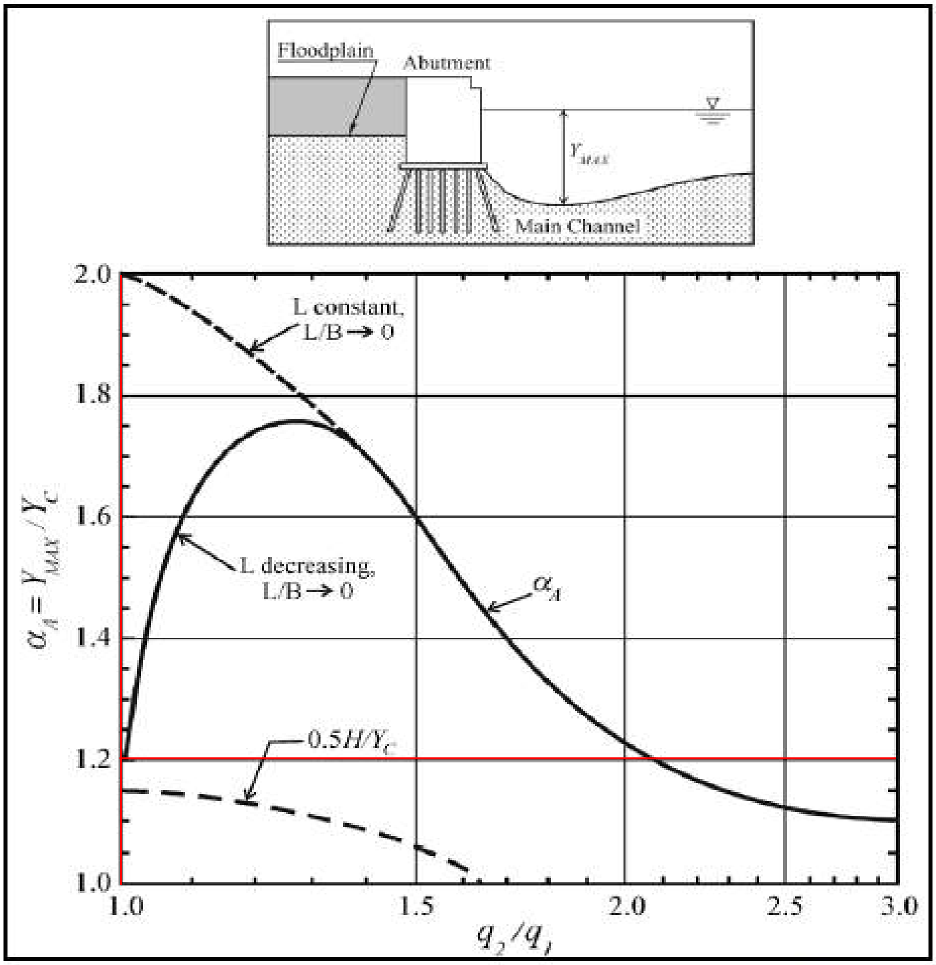


Figure 8.10. Scour amplification factor for wingwall abutments and live-bed conditions (NCHRP 2010b).

500-YR

| | | | |
|---|---|---|---|
| Project: | Attleboro Secondary Line over Three Mile River | | |
| Job No.: | E2X83500 | Location: | Norton, MA |
| Calced By: | JRB | Date: | 9/14/2020 |
| Checked By: | AMS | Date: | 10/4/2020 |

*(Type input values into the shaded boxes)*

## NCHRP 24-20 Abutment Scour Calculations

500-YR (Check Storm Event)

For Attleboro Secondary Line over Three Mile River

**Objective:**

Calculate total **abutment scour** experienced by the: **Proposed Bridge Abutment**

**Method:**

Use NCHRP 24-20 Abutment Scour Approach found in HEC-18 and the HEC-RAS model to solve for total scour depth for the 500-year storm. See Chapter 8 of HEC-18.

**Assumptions:**

If the projected length of embankment is 75% or greater than the width of the floodplain then live-bed scour caluclation is used. If the projected length of embankment is less than 75% of the floodplain width then clear-water scour caluclation is used.

**Calculations:**

Determine Scour Condition for Abutment

$L$ = 183.2 Length of Embankment
$B_f$ = 199.0 Width of Floodplain
$L/B_f$ = 0.92

L/Bf >= 0.75 **Live-Bed Scour**

Calculate Live-Bed Scour

$$y_c = y_1\left(\frac{q_{2c}}{q_1}\right)^{6/7}$$

$y_1$ = 12.92 Upstream flow depth, ft River Section: 535
$V$ = 5.96 Upstream Velocity Total, ft/s
$q_1$ = 77.0 Upstream unit discharge, $ft^2/s$
$Q$ = 3962.0 Total discharge in bridge opening, cfs
$W$ = 65.00 Width of Bridge Opening, ft
$q_{2c}$ = 61.0 Unit discharge in constricted opening accounting for non-uniform flow distribution, $ft^2/s$

$y_c$ = 10.6 Flow depth including live-bed contraction scour, ft

## 500-YR

| | | | |
|---|---|---|---|
| Project: | Attleboro Secondary Line over Three Mile River | | |
| Job No.: | E2X83500 | Location: | Norton, MA |
| Calced By: | JRB | Date: | 9/14/2020 |
| Checked By: | AMS | Date: | 10/4/2020 |

*(Type input values into the shaded boxes)*

## NCHRP 24-20 Abutment Scour Calculations

500-YR (Check Storm Event)

$$y_{max} = \alpha_A y_c$$

$$y_s = y_{max} - y_0$$

| | | |
|---|---|---|
| $q_{2c}/q_1$ = | 0.8 | |
| $\alpha_A$ = | 1.20 | Amplication factor for live-bed conditions, from table |
| $y_c$ = | 10.6 | Flow depth including live-bed contraction scour, ft |
| $y_{max}$ = | 12.7 | Maximum flow depth resulting from abutment scour, ft |
| $y_0$ = | 8.40 | Bridge channel flow depth prior to scour, ft |
| | | |
| $y_s$ = | 4.3 | Abutment Scour Depth |

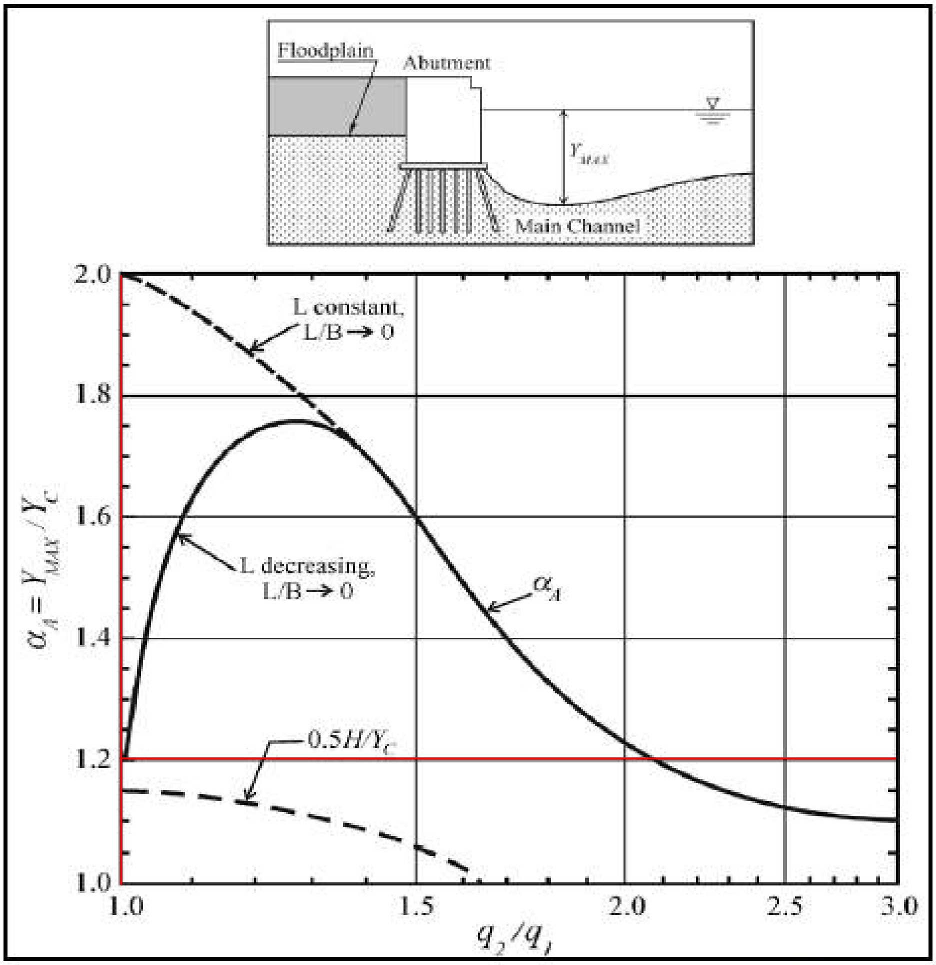


Figure 8.10. Scour amplification factor for wingwall abutments and live-bed conditions (NCHRP 2010b).

# APPENDIX H:

## RIPRAP PROTECTION CALCULATIONS

**JACOBS**

2 EXECUTIVE PARK DRIVE
BEDFORD, NH
603-666-7181

JOB NO. E2X83500 Attleboro Secondary Line over Three Mile River

SHEET NO. 1 OF 1

CALCULATED BY: JRB DATE: 9/14/2020

CHECKED BY: AMS DATE: 10/4/2020

**Objective**

Use the Federal Highway Administration's HEC-23, Sizing Rock Rip-rap at Abutments, to calculate the size of rip-rap, $d_{50}$, at the existing abutment.

**Method**

Use results from the 500-year existing conditions HEC-RAS analysis to calculate the $d_{50}$.

| | | | | |
|---|---|---|---|---|
| V = | Average velocity in the contracted section | 10.51 | ft/sec | |
| y = | Depth of Flow in the Contracted Section | 8.78 | ft | |
| $S_s$ = | Specific Gravity of Rock Rip-Rap | 2.65 | | |
| g = | Gravitational Acceleration | 32.2 | ft/sec$^2$ | |
| Froude Number = | $V/(gy)^{1/2}$ | 0.63 | Subcritical | Use ≤ 0.80 |
| K = | Constants for equations are different, see below. | 1.02 | | |
| $d_{50}$ = | Stone diameter | 2.12 | ft | |
| | | 25.45 | in | |

If Froude Number is ≤ 0.80:

$$d_{50} = \left( \frac{K}{(S_s - 1)} \left[ \frac{V^2}{gy} \right] \right) y$$

K = Constant: 1.02 for Vertical Wall Abutment
0.89 for spill-through abutment

If Froude Number is > 0.80:

$$\frac{D_{50}}{y} = \frac{K}{(S_s - 1)} \left[ \frac{V^2}{gy} \right]^{0.14}$$

K = Constant: 0.69 for Vertical Wall Abutment
0.61 for spill-through abutment

**Results**

Use $d_{50}$ 25.45 in

Thickness ( 38.18 in =1.5 times $d_{50}$

**Reference**

Hydraulic Engineering Circular No. 23, Publication No. FHWA NHI 01-003, "Bridge Scour and Stream Instability Countermeasures," Second Edition, March 2001

**JACOBS**

2 EXECUTIVE PARK DRIVE
BEDFORD, NH
603-666-7181

| | | | |
|---|---|---|---|
| JOB NO. | E2X83500 Attleboro Secondary Line over Three Mile River | | |
| SHEET NO. | 1 | OF | 1 |
| CALCULATED BY: | JRB | DATE: | 9/14/2020 |
| CHECKED BY: | AMS | DATE: | 10/4/2020 |

## Objective

Use the Federal Highway Administration's HEC-23, Sizing Rock Rip-rap at Abutments, to calculate the size of rip-rap, $d_{50}$, at the proposed abutment.

## Method

Use results from the 500-year proposed conditions HEC-RAS analysis to calculate the $d_{50}$.

| | | | | |
|---|---|---|---|---|
| V = | Average velocity in the contracted section | 7.26 | ft/sec | |
| y = | Depth of Flow in the Contracted Section | 8.4 | ft | |
| $S_s$ = | Specific Gravity of Rock Rip-Rap | 2.65 | | |
| g = | Gravitational Acceleration | 32.2 | ft/sec$^2$ | |
| Froude Number = | $V/(gy)^{1/2}$ | 0.44 | Subcritical | Use ≤ 0.80 |
| K = | Constants for equations are different, see below. | 1.02 | | |
| $d_{50}$ = | Stone diameter | 1.01 | ft | |
| | | 12.14 | in | |

If Froude Number is ≤ 0.80:

$$d_{50} = \left(\frac{K}{(S_s - 1)}\left[\frac{V^2}{gy}\right]\right)y$$

K = Constant: 1.02 for Vertical Wall Abutment
0.89 for spill-through abutment

If Froude Number is > 0.80:

$$\frac{D_{50}}{y} = \frac{K}{(S_s - 1)}\left[\frac{V^2}{gy}\right]^{0.14}$$

K = Constant: 0.69 for Vertical Wall Abutment
0.61 for spill-through abutment

## Results

| | | |
|---|---|---|
| Use $d_{50}$ | 12.15 | in |

| | | | |
|---|---|---|---|
| Thickness ( | 18.23 | in | =1.5 times $d_{50}$ |

## Reference

Hydraulic Engineering Circular No. 23, Publication No. FHWA NHI 01-003, "Bridge Scour and Stream Instability Countermeasures," Second Edition, March 2001

# Attachment F – NHESP Consultation

MASSWILDLIFE

DIVISION OF
**FISHERIES & WILDLIFE**

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
**MASS.GOV/MASSWILDLIFE**

January 27, 2021

James Eng
MA Department of Transportation Rail and Transit
10 Park Plaza, Room 4160
Boston MA 02116

RE: Project Location: Threemile River Bridge, Middleboro Subdivision at MP 6.84
Norton/Taunton
Project Description: Replace Threemile River Bridge
**NHESP File No.: 20-39827**

Dear Applicant:

Thank you for submitting the MESA Project Review Checklist, site plans (dated November 12, 2020) and other required materials to the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the “Division”) for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **will not result in a prohibited Take** of state-listed rare species. This determination is a final decision of the Division of Fisheries & Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Emily Holt, Endangered Species Review Assistant, at Emily.Holt@mass.gov.

Sincerely,

Everose Schlüter

Everose Schlüter, Ph.D.
Assistant Director

cc: Kyle Purdy, Jacobs Engineering Group Inc

Jacobs

December 28, 2020

Eve Schlüter
Assistant Director of Natural Heritage & Endangered Species Program
1 Rabbit Hill Road
Westborough, MA 01581

RE: Massachusetts Endangered Species Act (MESA) Project Review Checklist
MassDOT – Threemile River Bridge Replacement at Mile Post (MP) 6.84
Norton/Taunton, Massachusetts

Dear Ms. Schlüter:

In accordance with the Massachusetts Endangered Species Act (M.G.L. Chapter 131A) and the implementing regulations (321 CMR 10.00), Jacobs Engineering (Jacobs), on behalf of the Massachusetts Department of Transportation, Rail & Transit Division (MassDOT Rail & Transit), has prepared this MESA Project Review Checklist and supporting documentation to replace the Threemile River Bridge at MP 6.84 over the Threemile River (Project).

If you have any questions about the project, please feel free to contact me at kyle.purdy@jacobs.com or (518) 598-8242.

Sincerely,

Kyle Purdy

Kyle Purdy, CPESC
Jacobs

Enclosures: 1 Copy of MESA Project Review Checklist
CC: Chalita Belfield, Director of Railroad Properties, MassDOT Rail & Transit
James L. Eng, Deputy Rail Administrator, MassDOT Rail & Transit

MASSWILDLIFE

DIVISION OF
**FISHERIES & WILDLIFE**

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
**MASS.GOV/MASSWILDLIFE**

# MESA Project Review Checklist

*Massachusetts Endangered Species Act M.G.L. c.131A and Regulations (321 CMR 10.00)*

## 1) Project Location:

| | | |
|---|---|---|
| Middleboro Subdivision @ MP 6.84 | Norton/Taunton | 02766 and 02780 |
| Street Address/Location | City/Town | Zip Code |
| N/A | N/A | |
| Assessors Map/Plat Number | Parcel /Lot Number | |

Property recorded at the Registry of Deeds for:

| | |
|---|---|
| Bristol | N/A |
| County | Certificate # (if registered land) |
| N/A | N/A |
| Book | Page Number |

## 2) Applicant:

| | | |
|---|---|---|
| James | Eng | MassDOT Rail & Transit Division |
| First Name | Last Name | Company |
| 10 Park Plaza, Room 4160 | | |
| Mailing Address | | |
| Boston | MA | 02116 |
| City/Town | State | Zip Code |
| 857-368-8963 | N/A | james.eng@dot.state.ma.us |
| Phone Number | Fax Number | Email address |

## 3) Property owner (if different from applicant):

| | | |
|---|---|---|
| | | |
| First Name | Last Name | Company |
| | | |
| Mailing Address | | |
| | | |
| City/Town | State | Zip Code |
| | | |
| Phone Number | Fax Number | Email address |

## 4) Representative (if any):

| | | |
|---|---|---|
| Jacobs Engineering | | |
| Company | | |
| Kyle | Purdy | |
| Contact Person First Name | Contact Person Last Name | |
| 120 Saint James Avenue, 5th Floor | | |
| Mailing Address | | |
| Boston | MA | 02116 |
| City/Town | State | Zip Code |
| 518.598.8242 | N/A | Kyle.Purdy@jacobs.com |
| Phone Number | Fax Number | Email address |

## Additional Information

1. Will this project require a filing with the Conservation Commission and/or DEP? ☐ No ☑ Yes
2. Has this project previously been issued a NHESP Tracking Number (either by previous NOI Submittal or MESA Information Request Form)? ☑ No ☐ Yes, if Yes -Tracking No.__________

## Project Description (attach separate sheet, as needed)

Please note, certain projects or activities are exempt from review, see 321 CMR 10.14. The MESA does not allow project segmentation. Your filing must reflect all anticipated work associated with the proposed project (CMR 321 10.16).

The Massachusetts Department of Transportation (MassDOT) Rail and Transit Division is proposing to replace the Threemile River Bridge (Project). The bridge (Bridge No. N-23-029) is located along the Middleboro Subdivision) at Mile Post (MP) 6.84 in the Town of Norton and City of Taunton, Massachusetts (Site). The existing bridge is in poor condition and continues to deteriorate. Further deterioration of the structure could result in the inability to operate trains over the compromised bridge, and would result in delivery delays for freight traffic, as well as the potential failure or need for emergency repairs that would result in significant rail outages.

## Include the Following Information:

ALL Applicants must submit:

- USGS map (1:24,000 or 1:25,000) with property boundary clearly outlined
- Project plans for entire site (including wetland Resource Areas, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work)
- Assessor's map or right-of-way plan of site
- Statement/proof that applicant is the Record Owner or that applicant is a person authorized in writing by the record owner to submit this filing
- Photographs representative of the site

Projects altering 10 or more acres, must also submit:

- A vegetation cover type map of the site
- Project plans showing Priority Habitat boundaries

The NHESP may request additional information, such as, but not limited to, species and habitat surveys, wetland reports, soil map and reports, and stormwater management reports (321 CMR 10.16). The NHESP will notify the applicant within 30 days if the materials submitted do not satisfy requirements for a filing and request submission of any missing materials (321 CMR 10.18(1)).

## Filing Fee, Payable to Comm. of MA - NHESP (see website for fee information)

a. Total MESA Fee Paid $300.00 b. Acreage of Disturbance 0.53 c. Total Site Acreage 2.03

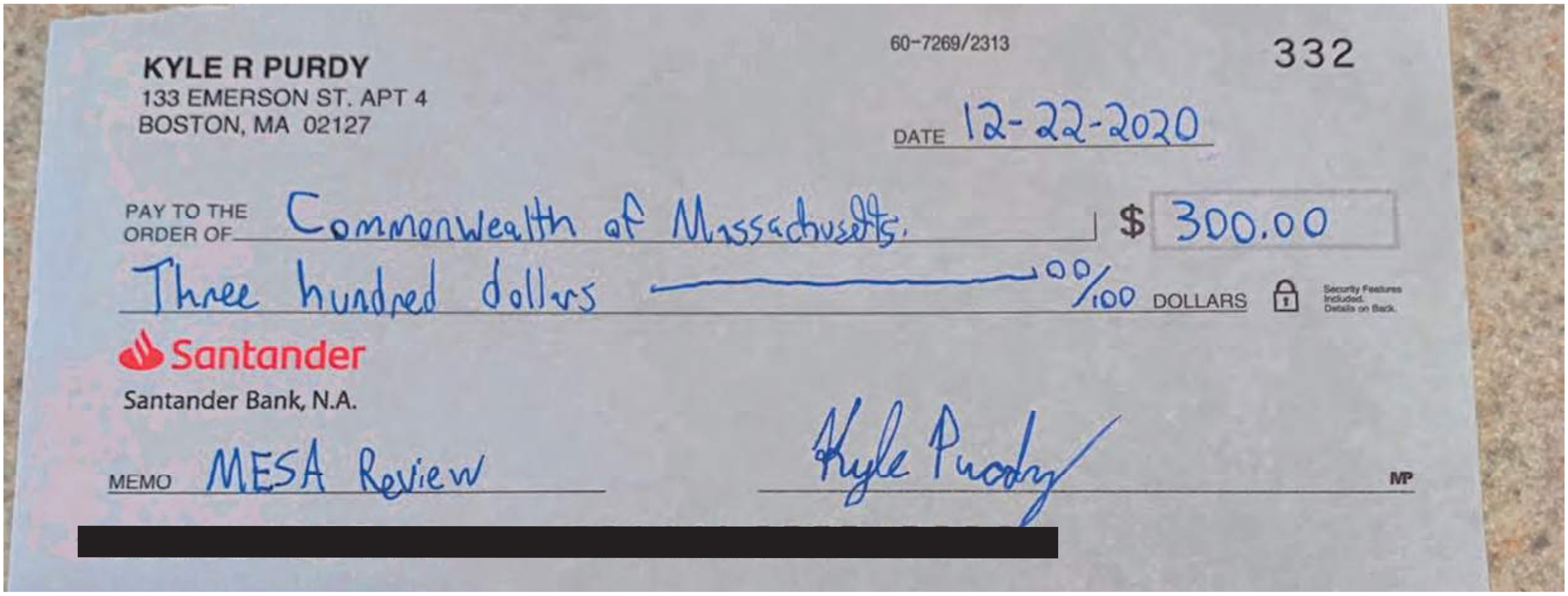
## Required Signatures

I hereby certify under the penalties of perjury that the foregoing MESA filing and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge.

December 24, 2020

Signature of Property Owner/Record Owner of Property Date

Signature of Applicant (if different from Owner) Date



**KYLE R PURDY**
133 EMERSON ST. APT 4
BOSTON, MA 02127

60-7269/2313

332

DATE 12-22-2020

PAY TO THE ORDER OF Commonwealth of Massachusetts. $ 300.00

Three hundred dollars —— 00/100 DOLLARS

Security Features Included. Details on Back.

Santander

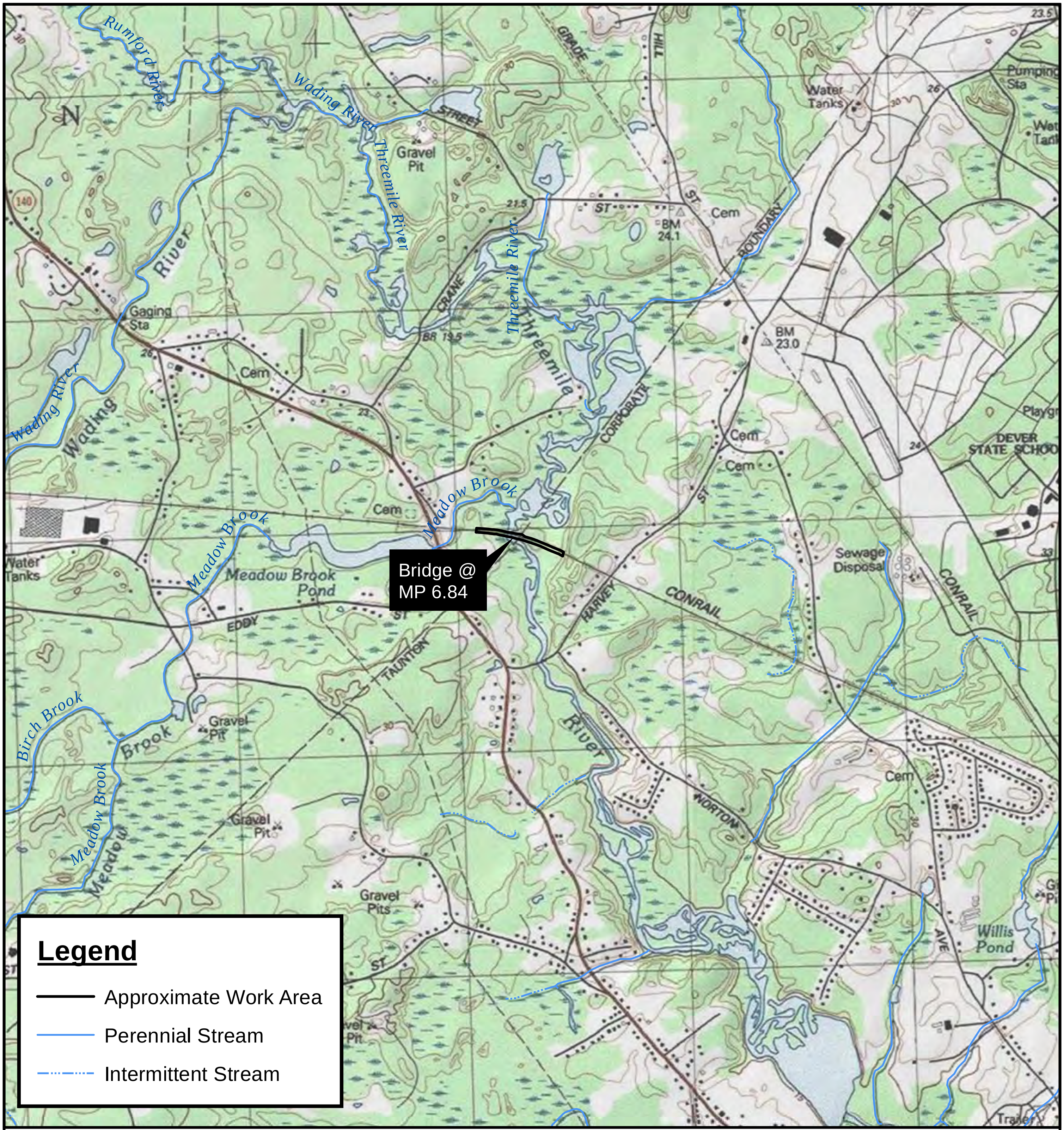
Santander Bank, N.A.

MEMO MESA Review

Kyle Purdy

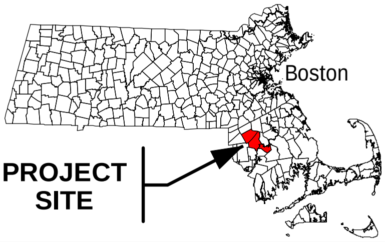
MP

[redacted]



## Legend

| | |
|---|---|
| ▬ | Approximate Work Area |
| ▬ | Perennial Stream |
| ‐‐‐ | Intermittent Stream |



**PROJECT SITE**

Source: MassGIS, Commonwealth of Massachusetts, Information Technology Division: USGS Taunton, MA 7.5 MinuteTopographic Quadrangles

N W E S

1 inch = 2,000 feet

2,000 0 2,000 Feet

**Prepared for:**

massDOT

**Prepared by:**

Jacobs

# FIGURE 1 - USGS MAP

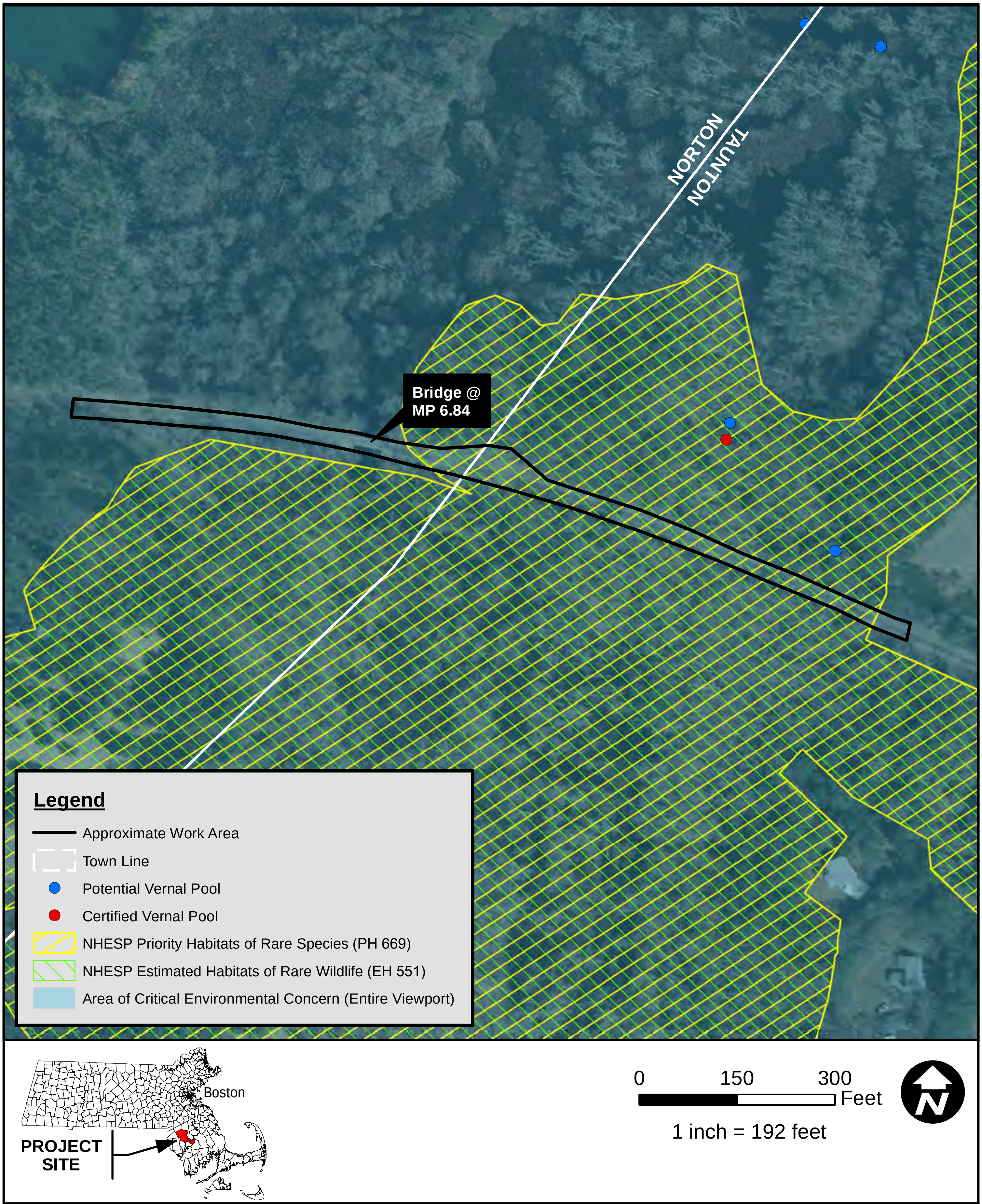
THREEMILE RIVER BRIDGE REPLACEMENT AT MILE POST 6.84
NORTON & TAUNTON, BRISTOL COUNTY, MASSACHUSETTS

**NOV 2020**

**E2X83500**

Location: \\BOSFIL11\Data2\NAI_proj\MASSDOT\2019\E2X83500\TASK 14 - Middleboro Bridge MP 6.84\600 Discipline Files\670 Environmental\GIS\Figure 1 - USGS Map.mxd

Location: \\BOSFIL11\Data2\NAI_proj\MASSDOT2019\E2X83500\TASK 14 - Middleboro Bridge MP 6.84\600 Discipline Files\670 Environmental\GIS\Figure 7 - NHESP & Others Map.mxd


NORTON
TAUNTON
Bridge @ MP 6.84
Legend
Approximate Work Area
Town Line
Potential Vernal Pool
Certified Vernal Pool
NHESP Priority Habitats of Rare Species (PH 669)
NHESP Estimated Habitats of Rare Wildlife (EH 551)
Area of Critical Environmental Concern (Entire Viewport)
Boston
PROJECT SITE
0
150
300
Feet
1 inch = 192 feet
N

Prepared for:

massDOT

Prepared by:

Jacobs

# FIGURE 2 - NHESP & OTHERS MAP

THREEMILE RIVER BRIDGE REPLACEMENT AT MILE POST 6.84
NORTON & TAUNTON, BRISTOL COUNTY, MASSACHUSETTS

NOV 2020

E2X83500

# MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
# RAIL AND TRANSIT DIVISION

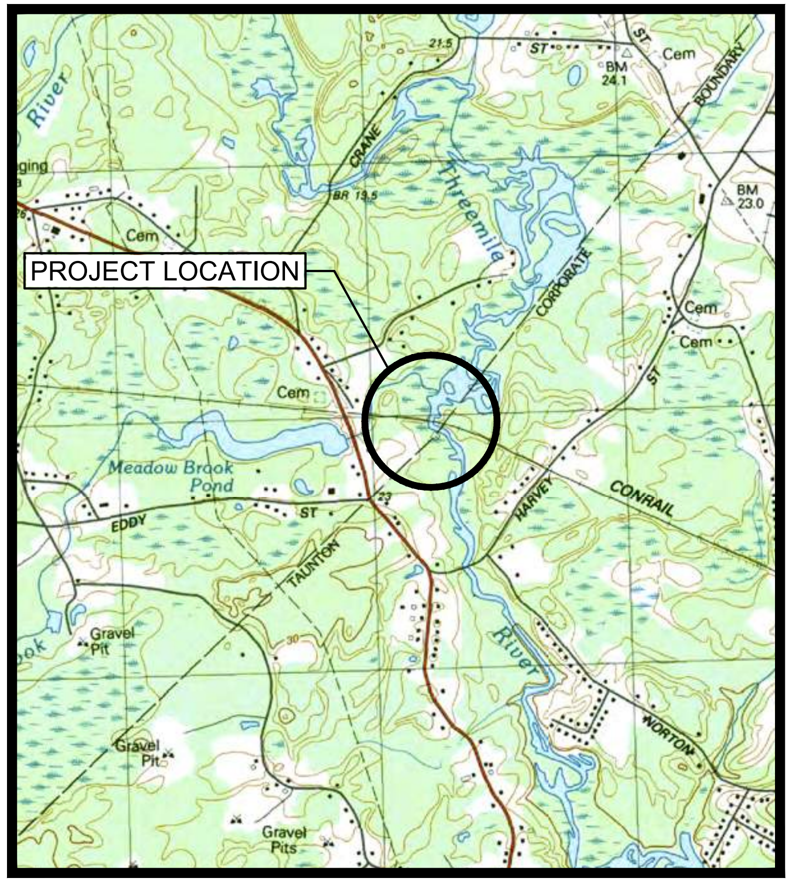
## MIDDLEBORO SUBDIVISION
## PROPOSED REPLACEMENT OF BRIDGE AT MILE POST 6.84

IN THE TOWNS OF

NORTON AND TAUNTON
BRISTOL COUNTY

### INDEX

| SHEET NO. | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET AND INDEX |
| 2 | GENERAL NOTES |
| 3 | WETLAND AREA PLAN SHEET 1 |
| 4 | WETLAND AREA PLAN SHEET 2 |
| 5 | WETLAND AREA PLAN SHEET 3 |
| 6 | WETLAND AREA PLAN SHEET 4 |
| 7 | WETLAND AREA PLAN SHEET 5 |
| 8 | DETAIL SHEET |



PROJECT LOCATION

LOCUS PLAN

SCALE: 1" = 2000'

0 2500 5000

SCALE IN FEET

Jacobs

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

DATE:
November 12, 2020

MIDDLEBOROUGH SUBDIVISION
NORTON AND TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 1 OF 8

\\BOSFIL11\WAL_Proj\MASSDOT\2019\E2X83500\TASK 14 – Middleboro Bridge MP 6.84\700 CADD\711-ENVR\MP 6.84 Notice of Intent.dwg November 12, 2020

DESIGN STANDARDS AND CODES OF PRACTICE

- AREMA MANUAL FOR RAILWAY ENGINEERING, 2018 EDITION
- DESIGN LOAD: COPPER E-80

VERTICAL ELEVATIONS: NAVD 88

COORDINATES: MASSACHUSETTS STATE COORDINATE SYSTEM NAD 83

## DEWATERING PROCEDURES NOTES:

1. A TEMPORARY PIT WILL BE CONSTRUCTED TO DEWATER THE WORK AREA USING PIPE AND STONE FOR PUMPING EXCESSIVE WATER FROM EXCAVATIONS TO THE SUITABLE DEWATERING STRUCTURE AREA; A WELL VEGETATED UPLAND AREA LOCATED EAST AND WEST OF THE BRIDGE.
2. A PERFORATED VERTICAL STANDPIPE WILL BE PLACED IN THE CENTER OF THE PIT AND SURROUNDED WITH A STONE SCREENING MATERIAL TO COLLECT FILTERED WATER. WATER IS THEN PUMPED FROM THE CENTER OF THE PIPE TO THE DEWATERING STRUCTURE AREA.
3. DISCHARGE OF TURBID WATER PUMPED FROM THE STANDPIPE SHOULD BE TO THE DEWATERING STRUCTURE, WHERE IT HAS A CHANCE TO FLOW THROUGH THREE LEVELS OF FILTRATION; SILTBAG, FILTER FABRIC, AND HAYBALES (SEE DETAIL FOR DEWATERING STRUCTURE).

## CONSTRUCTION NOTES:

1. A TEMPORARY BARRIER WILL BE PLACED AROUND BOTH ABUTMENTS PRIOR TO DEMOLITION. THIS WILL PREVENT WATER FROM FLOODING THE WORK AREA SO THAT CONSTRUCTION CAN TAKE PLACE WITHOUT DISCHARGING SEDIMENT INTO THE WATER RESOURCE, AS WELL AS SECURELY INSTALL THE FOOTINGS OF THE NEW ABUTMENTS.
2. THE FOUNDATION AREA FOR THE PLACEMENT OF THE STRUCTURAL STEEL FRAMING AND THE IMPERVIOUS FABRIC MEMBRANE SHALL BE AS DIRECTED BY THE MANUFACTURER OR BY QUALIFIED PERSONNEL.
3. A MINIMUM OF 2 FEET OF FREEBOARD SHALL BE PROVIDED ABOVE THE EXPECTED HIGH WATER ELEVATION.
4. PARTICULAR ATTENTION SHOULD BE GIVEN TO THE FOUNDATION SUPPORT SYSTEM AT PERIMETER OF STRUCTURAL COMPONENT DAMS. ANY UNDERMINED OR SETTLED AREAS SHALL BE RESTORED IMMEDIATELY.
5. ANY HOLES, LEAKS, OR TORN AREAS IN THE GEO-MEMBRANES OR FABRIC SHALL BE REPAIRED IMMEDIATELY.
6. INSPECT THE INTERIOR DEWATERING SYSTEM AND ENSURE THAT THE SYSTEM IS DISCHARGING CLEAN WATER PRIOR TO RETURNING TO THE WATER RESOURCE.
7. REPAIR OR REPLACE ANY LOSS OF ROCK RIPRAP OR FILL THAT MAY OCCUR.
8. UPON COMPLETION OF THE CONSTRUCTION WORK, REMOVE ALL EXCESS MATERIAL, ACCUMULATED SEDIMENT AND DEBRIS FROM THE WORK AREA.

Jacobs

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

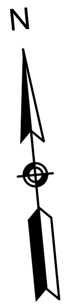
DATE:
November 12, 2020

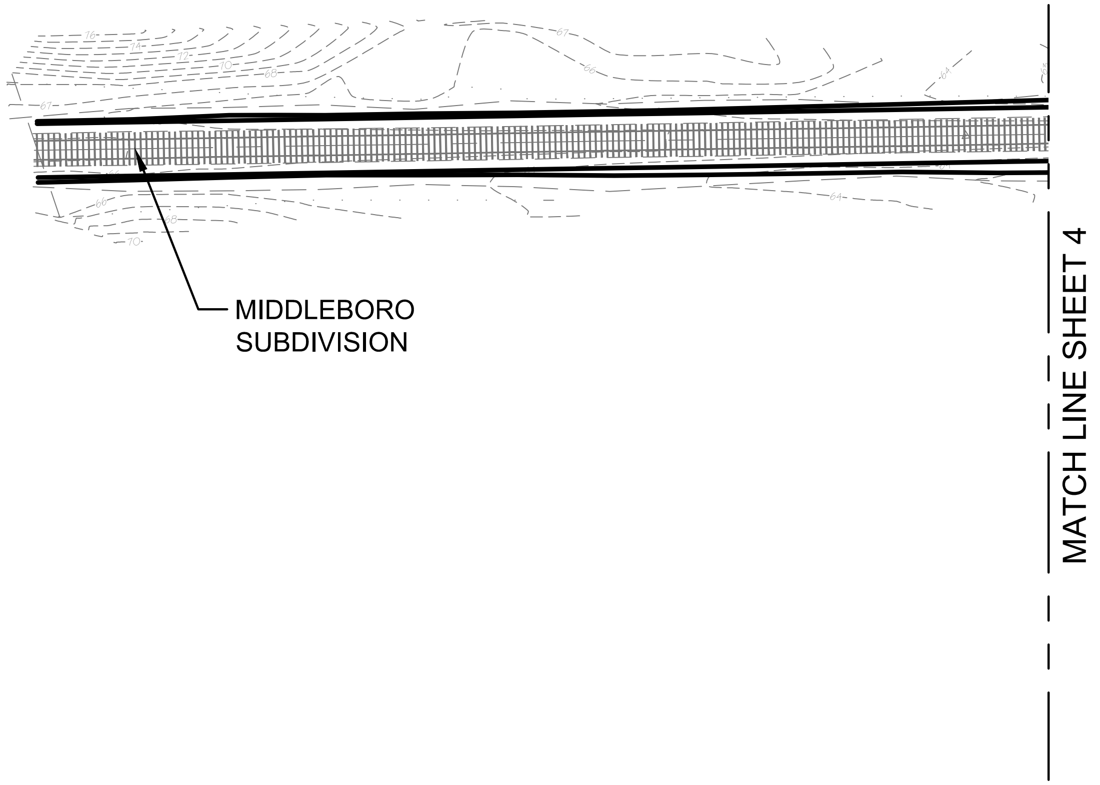
MIDDLEBOROUGH SUBDIVISION
NORTON AND TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 2 OF 8

\\BOSFIL11\WAL_Proj\MASSDOT\2019\E2X83500\TASK 14 — Middleboro Bridge MP 6.84\700 CADD\711-ENVIR\MP 6.84 Notice of Intent.dwg November 12, 2020

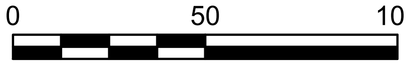
\\BOSFIL11\WAL_Proj\MASSDOT\2019\E2X83500\TASK 14 – Middleboro Bridge MP 6.84\700 CADD\711–ENVIR\MP 6.84 Notice of Intent.dwg November 12, 2020





LEGEND

| | |
|---|---|
| W1–1 (green dashed line) | BORDERING VEGETATIVE WETLAND (BVW) |
| (orange dashed line) | 100-FOOT BUFFER ZONE TO BVW |
| PS1–1 (blue dashed line) | PERENNIAL STREAM (PS) |
| (pink dashed line) | 200-FOOT RIVERFRONT AREA |
| ——— – – ——— | PROPERTY LINE |
| ▨ | COIR LOG |



SCALE IN FEET

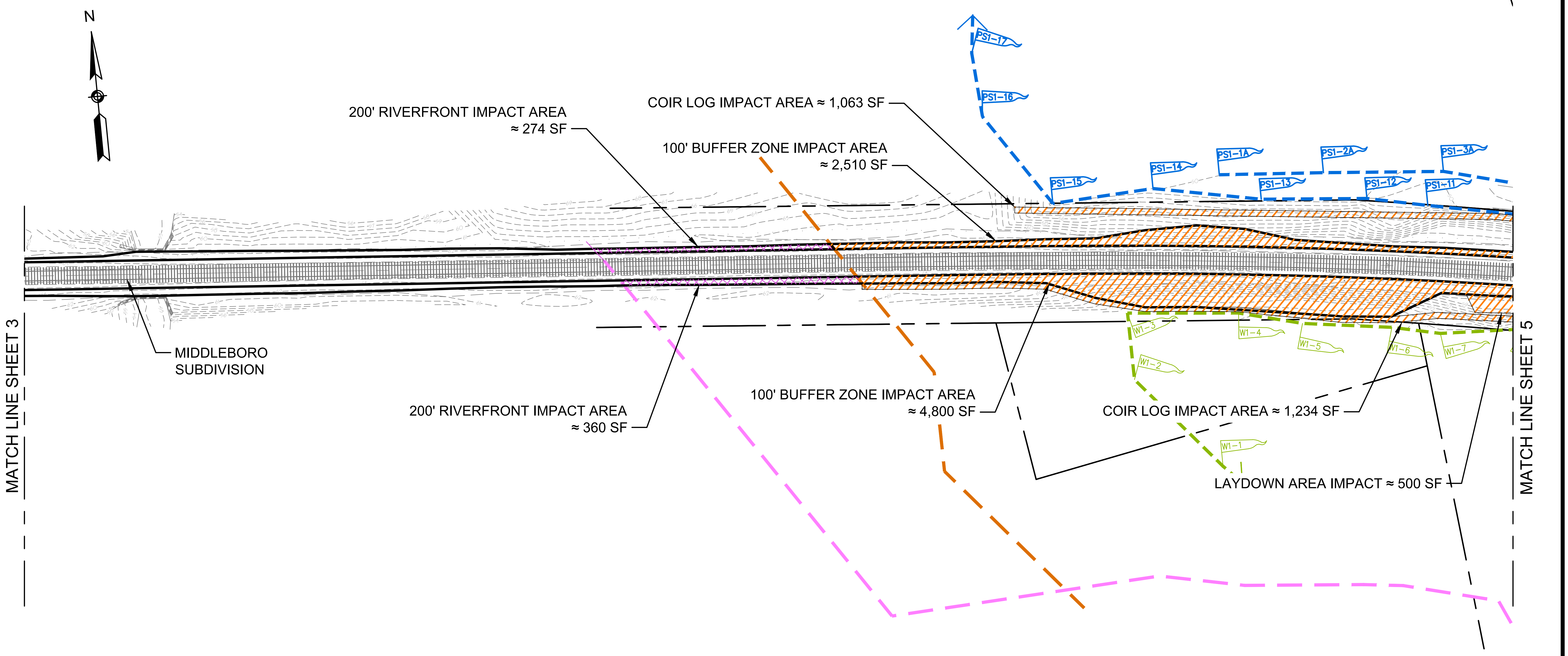
Jacobs

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

DATE:
November 12, 2020

MIDDLEBOROUGH SUBDIVISION
TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 3 OF 8


N
COIR LOG IMPACT AREA ≈ 1,063 SF
200' RIVERFRONT IMPACT AREA
≈ 274 SF
100' BUFFER ZONE IMPACT AREA
≈ 2,510 SF
PS1-17
PS1-16
PS1-15
PS1-14
PS1-1A
PS1-13
PS1-2A
PS1-12
PS1-3A
PS1-11
MATCH LINE SHEET 3
MIDDLEBORO
SUBDIVISION
200' RIVERFRONT IMPACT AREA
≈ 360 SF
100' BUFFER ZONE IMPACT AREA
≈ 4,800 SF
W1-3
W1-4
W1-5
W1-6
W1-7
W1-2
W1-1
COIR LOG IMPACT AREA ≈ 1,234 SF
LAYDOWN AREA IMPACT ≈ 500 SF
MATCH LINE SHEET 5

LEGEND

W1-1 BORDERING VEGETATIVE WETLAND (BVW)

100-FOOT BUFFER ZONE TO BVW

PS1-1 PERENNIAL STREAM (PS)

200-FOOT RIVERFRONT AREA

PROPERTY LINE

▨ COIR LOG

0 50 100
SCALE IN FEET

**Jacobs**

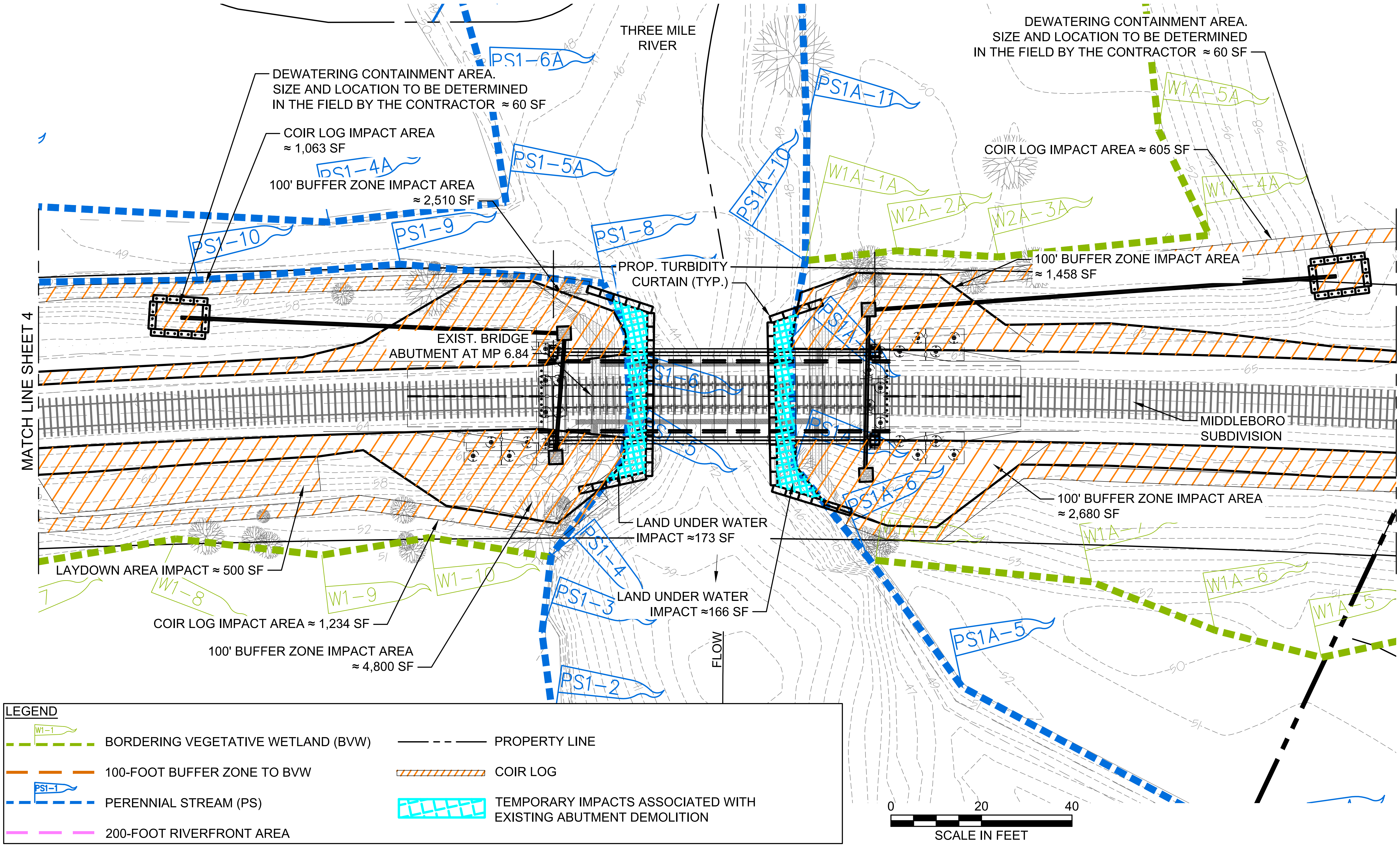
**massDOT**
Massachusetts Department of Transportation
Rail & Transit Division

DATE:
November 12, 2020

MIDDLEBOROUGH SUBDIVISION
TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 4 OF 8

\\BOSFIL11\WAL_Proj\MASSDOT\2019\E2X83500\TASK 14 – Middleboro Bridge MP 6.84\700 CADD\711–ENVR\MP 6.84 Notice of Intent.dwg November 12, 2020


THREE MILE RIVER
DEWATERING CONTAINMENT AREA. SIZE AND LOCATION TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR ≈ 60 SF
DEWATERING CONTAINMENT AREA. SIZE AND LOCATION TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR ≈ 60 SF
COIR LOG IMPACT AREA ≈ 1,063 SF
100' BUFFER ZONE IMPACT AREA ≈ 2,510 SF
COIR LOG IMPACT AREA ≈ 605 SF
100' BUFFER ZONE IMPACT AREA ≈ 1,458 SF
PROP. TURBIDITY CURTAIN (TYP.)
EXIST. BRIDGE ABUTMENT AT MP 6.84
MIDDLEBORO SUBDIVISION
100' BUFFER ZONE IMPACT AREA ≈ 2,680 SF
LAND UNDER WATER IMPACT ≈173 SF
LAND UNDER WATER IMPACT ≈166 SF
LAYDOWN AREA IMPACT ≈ 500 SF
COIR LOG IMPACT AREA ≈ 1,234 SF
100' BUFFER ZONE IMPACT AREA ≈ 4,800 SF
FLOW
MATCH LINE SHEET 4
MATCH LINE SHEET 6
PS1-6A
PS1-5A
PS1-4A
PS1-10
PS1-9
PS1-8
PS1-6
PS1-5
PS1-4
PS1-3
PS1-2
PS1A-11
PS1A-10
PS1A-6
PS1A-5
W1A-5A
W1A-4A
W1A-1A
W2A-2A
W2A-3A
W1A-7
W1A-6
W1A-5
W1-8
W1-9
W1-10
LEGEND
BORDERING VEGETATIVE WETLAND (BVW)
100-FOOT BUFFER ZONE TO BVW
PERENNIAL STREAM (PS)
200-FOOT RIVERFRONT AREA
PROPERTY LINE
COIR LOG
TEMPORARY IMPACTS ASSOCIATED WITH EXISTING ABUTMENT DEMOLITION
0 20 40
SCALE IN FEET

**Jacobs**

massDOT
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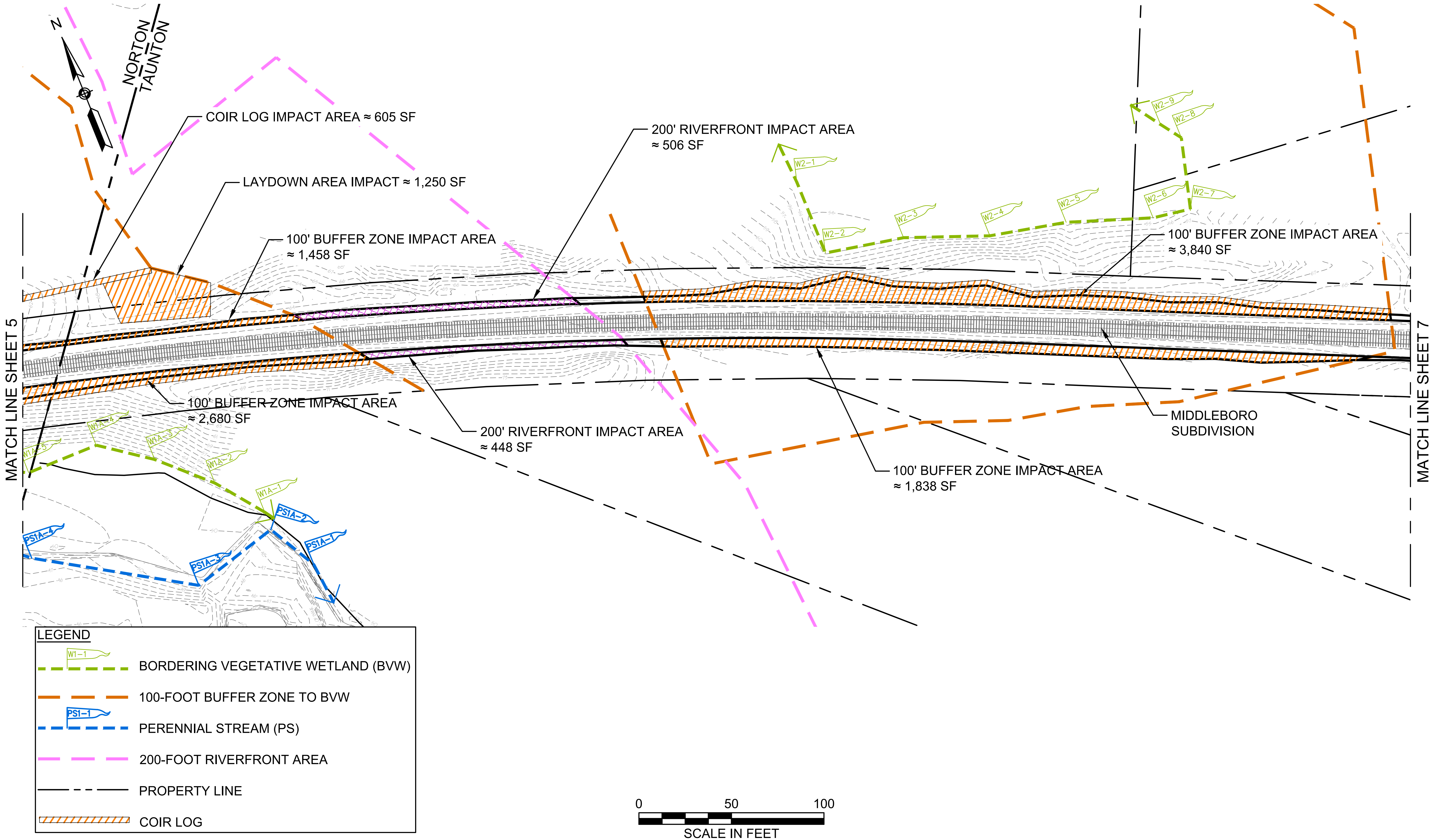
MIDDLEBOROUGH SUBDIVISION
NORTON, MA

BRIDGE AT MP 6.84
SHEET 5 OF 8

\\BOSFIL11\WAL_Proj\MASSDOT\2019\E2X83500\TASK 14 – Middleboro Bridge MP 6.84\700 CADD\711-ENVR\MP 6.84 Notice of Intent.dwg November 12, 2020


N
NORTON
TAUNTON
COIR LOG IMPACT AREA ≈ 605 SF
LAYDOWN AREA IMPACT ≈ 1,250 SF
100' BUFFER ZONE IMPACT AREA ≈ 1,458 SF
200' RIVERFRONT IMPACT AREA ≈ 506 SF
100' BUFFER ZONE IMPACT AREA ≈ 3,840 SF
100' BUFFER ZONE IMPACT AREA ≈ 2,680 SF
200' RIVERFRONT IMPACT AREA ≈ 448 SF
100' BUFFER ZONE IMPACT AREA ≈ 1,838 SF
MIDDLEBORO SUBDIVISION
MATCH LINE SHEET 5
MATCH LINE SHEET 7
W2-1
W2-2
W2-3
W2-4
W2-5
W2-6
W2-7
W2-8
W2-9
W1A-1
W1A-2
W1A-3
W1A-4
W1A-5
PS1A-1
PS1A-2
PS1A-3
PS1A-4
LEGEND
W1-1
BORDERING VEGETATIVE WETLAND (BVW)
100-FOOT BUFFER ZONE TO BVW
PS1-1
PERENNIAL STREAM (PS)
200-FOOT RIVERFRONT AREA
PROPERTY LINE
COIR LOG
0
50
100
SCALE IN FEET

\\BOSFIL11\NAI_Proj\MASSDOT\2019\E2X83500\TASK 14 – Middleboro Bridge MP 6.84\700 CADD\711-ENVIR\MP 6.84 Notice of Intent.dwg November 12, 2020

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Massachusetts Department of Transportation
Rail & Transit Division

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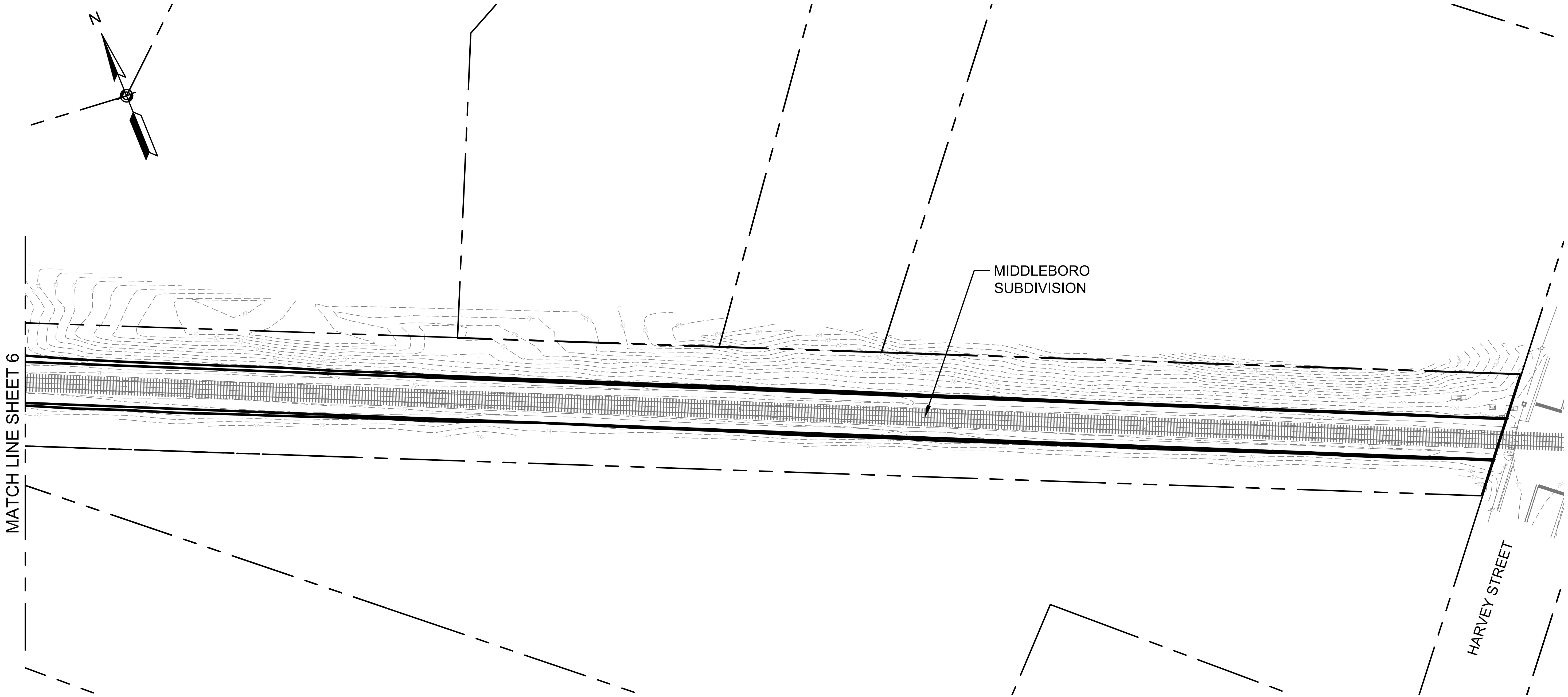
MIDDLEBOROUGH SUBDIVISION
TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 6 OF 8



LEGEND

- W1-1 BORDERING VEGETATIVE WETLAND (BVW)
- 100-FOOT BUFFER ZONE TO BVW
- PS1-1 PERENNIAL STREAM (PS)
- 200-FOOT RIVERFRONT AREA
- PROPERTY LINE
- ▨ COIR LOG

0 50 100

SCALE IN FEET

Jacobs

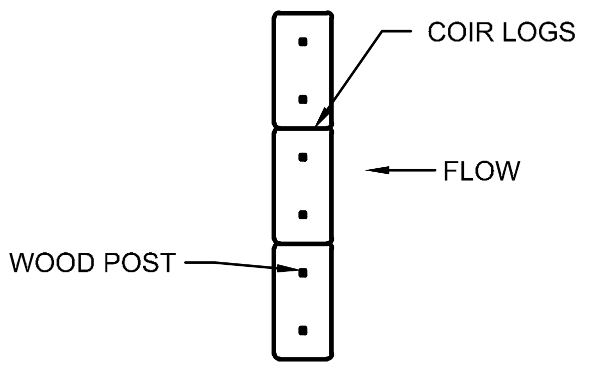
massDOT Massachusetts Department of Transportation Rail & Transit Division

DATE:
November 12, 2020

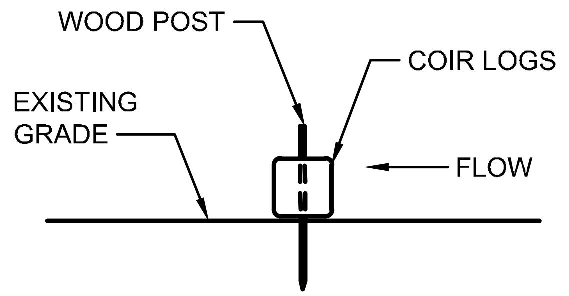
MIDDLEBOROUGH SUBDIVISION
TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 7 OF 8

\\BOSFIL11\NAI_Proj\MASSDOT\2019\E2X83500\TASK 14 – Middleboro Bridge MP 6.84\700 CADD\711-ENVIR\MP 6.84 Notice of Intent.dwg November 12, 2020

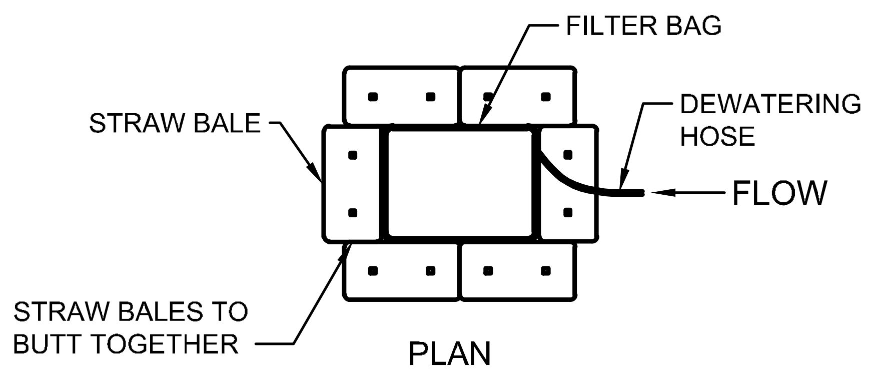


PLAN

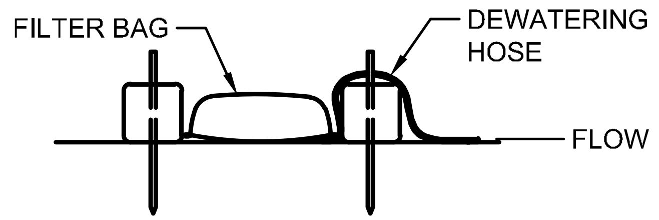


SECTION

## COIR LOGS EROSION CONTROL BARRIER

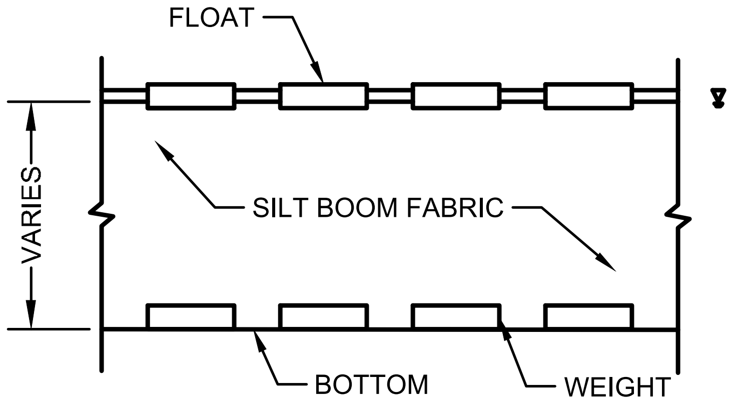


PLAN



SECTION

## DEWATERING CONTAINMENT AREA DETAIL



## TURBIDITY CURTAIN

NOT TO SCALE

EROSION CONTROL NOTES:

1. PRIOR TO BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT FOR ACCEPTANCE A GENERAL WORK SCHEDULE, CONSTRUCTION SEQUENCE AND PLAN WHICH INDICATES PLANNED IMPLEMENTATION OF TEMPORARY AND PERMANENT EROSION CONTROL MEASURES. THIS PLAN SHALL INCLUDE PROPOSED METHODS OF SOILS MANAGEMENT AND DISPOSAL OF WASTE MATERIALS.
2. THE TOE OF ANY SLOPE IS TO REMAIN AT LEAST ONE FOOT INSIDE OF ALL EROSION CONTROLS. UNDER NO CIRCUMSTANCE SHALL THE CONTRACTOR COVER ANY PORTION OF THE EROSION CONTROLS WITH MATERIAL. ANY MATERIAL THAT IS PLACED ON ANY EROSION CONTROLS BY THE CONTRACTOR, OR ANY AGENT OF THE CONTRACTOR, SHALL BE IMMEDIATELY REMOVED BY THE CONTRACTOR, AND ANY NECESSARY REPAIRS TO THE EROSION CONTROLS ACCOMPLISHED, AT NO COST TO THE OWNER.
3. ADDITIONAL EROSION CONTROLS SHALL BE INSTALLED AS CONDITIONS WARRANT, OR AS DIRECTED BY THE ENGINEER.
4. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EROSION CONTROL MAINTENANCE AND SHALL INSPECT AND/OR REPLACE ALL CONTROLS AS NEEDED. MAINTENANCE WILL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS AND PERMIT CONDITIONS. THE CONTRACTOR IS RESPONSIBLE FOR CARRYING OUT NECESSARY MAINTENANCE DURING ALL PHASES OF PROJECT CONSTRUCTION.
5. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING RUNOFF FLOW DURING STORMS AND PERIODS OF RAINFALL, THROUGHOUT THE WORK AREA.
6. SEDIMENTATION CONTROL DEVICES SHALL BE INSPECTED CLOSELY AND MAINTAINED PROMPTLY AS DESCRIBED IN THE SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER.
7. DISTURBED SLOPES ALONG THE ROW EMBANKMENT WITHIN THE WORK ZONE WILL BE STABILIZED WITH LOAM AND SEED OR BALLAST.

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massDOT
Massachusetts Department of Transportation
Rail & Transit Division

DATE:
November 12, 2020

MIDDLEBOROUGH SUBDIVISION
NORTON AND TAUNTON, MA

BRIDGE AT MP 6.84
SHEET 8 OF 8

## PHOTOGRAPHIC LOG

**Site Location:** MassDOT Rail, Norton and Taunton, Massachusetts

**Project No.** E2X83500

**Photo No.** 1

**Date:** 1/22/2020

**Direction Photo Taken:**
Northeast (left photograph) and East (right photograph).

**Description:**
View of bridge abutments. Photographs taken from edge of Perennial Stream 1.

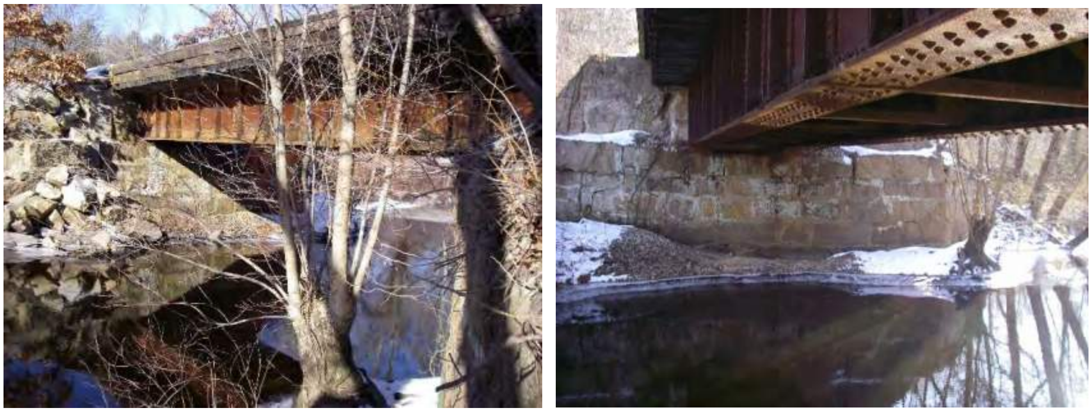
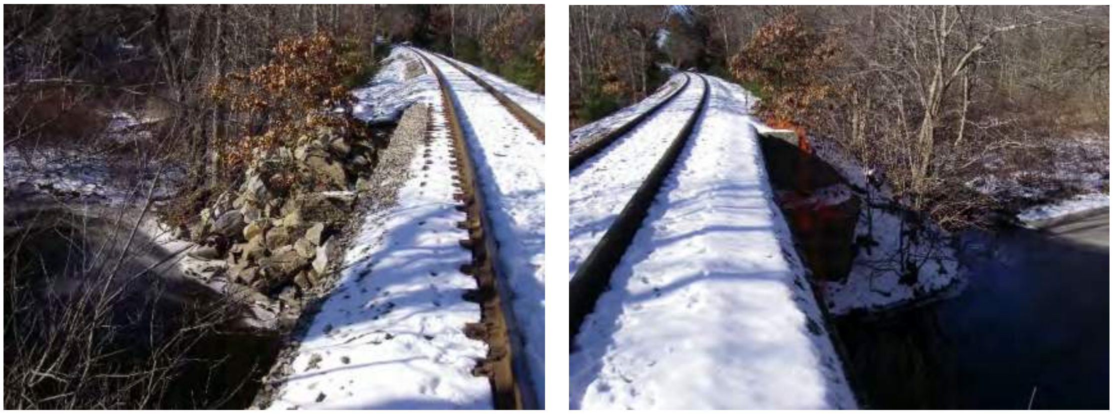


**Photo No.** 2

**Date:** 1/22/2020

**Direction Photo Taken:**
West.

**Description:**
View of western bridge abutment; left photograph taken of southern side of railroad and right photograph taken of northern side of railroad. Photographs taken from atop of the railroad tracks.



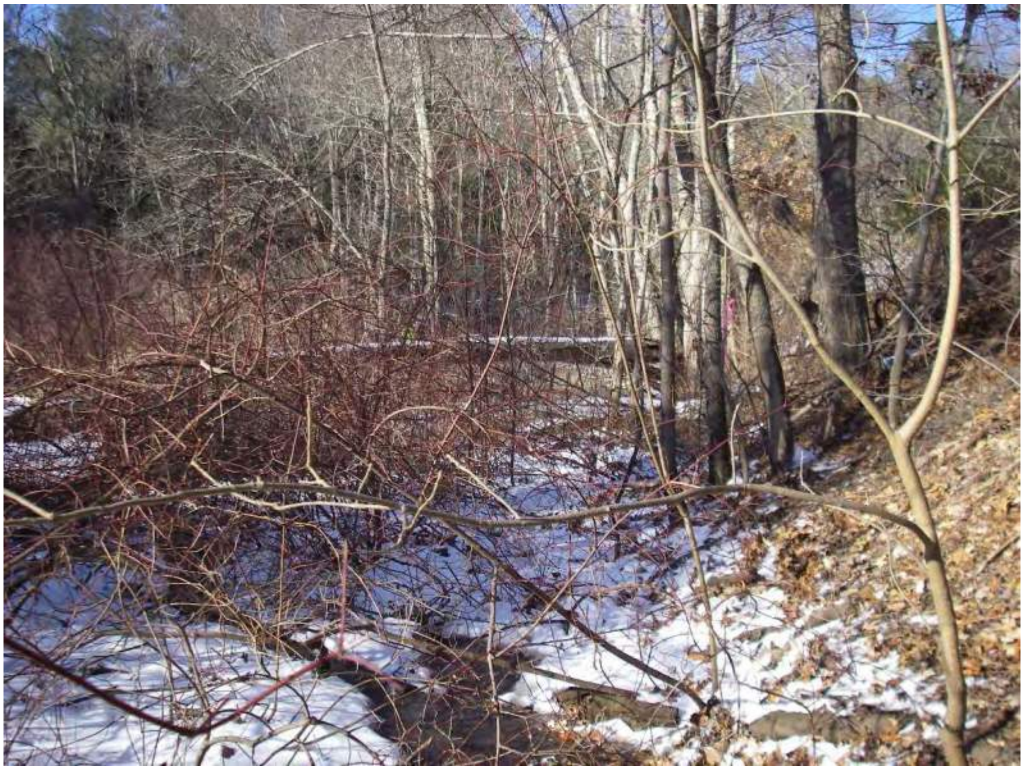
# PHOTOGRAPHIC LOG

| | |
|---|---|
| **Site Location:** MassDOT Rail, Norton and Taunton, Massachusetts | **Project No.** E2X83500 |

| Photo No. | Date: |
|---|---|
| 3 | 1/22/2020 |

**Direction Photo Taken:**
West.

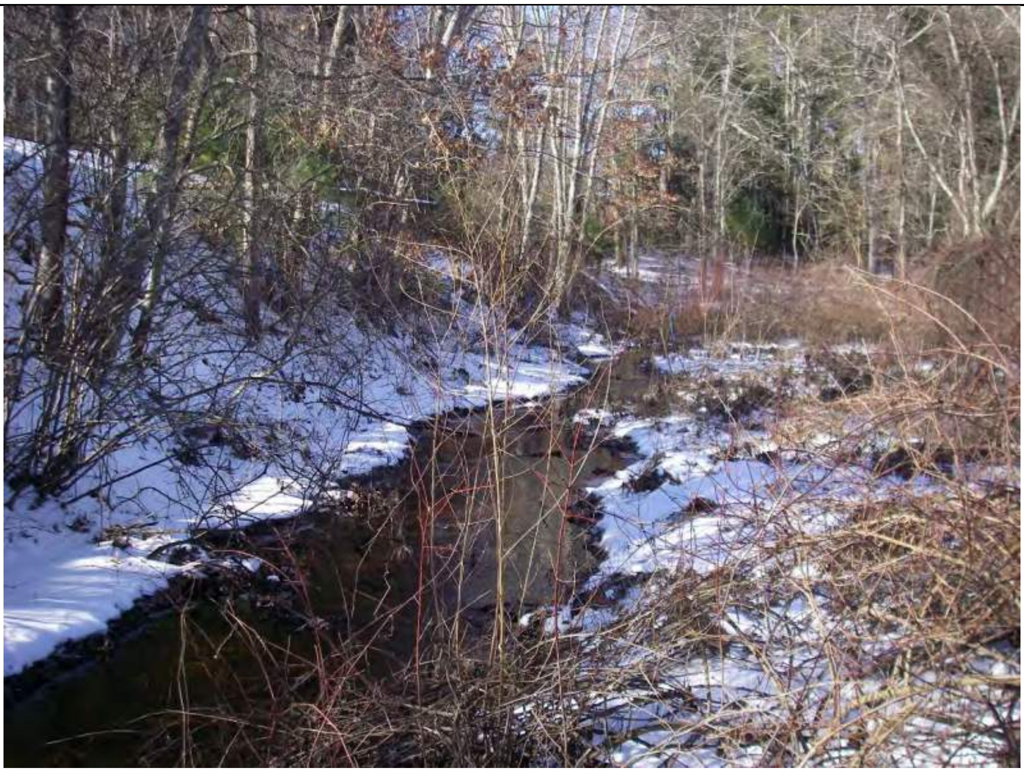
**Description:**
View of Wetland 1 located along the toe-of-slope of the railroad embankment. Photograph taken from delineation flag W1-12 + PS1-4.



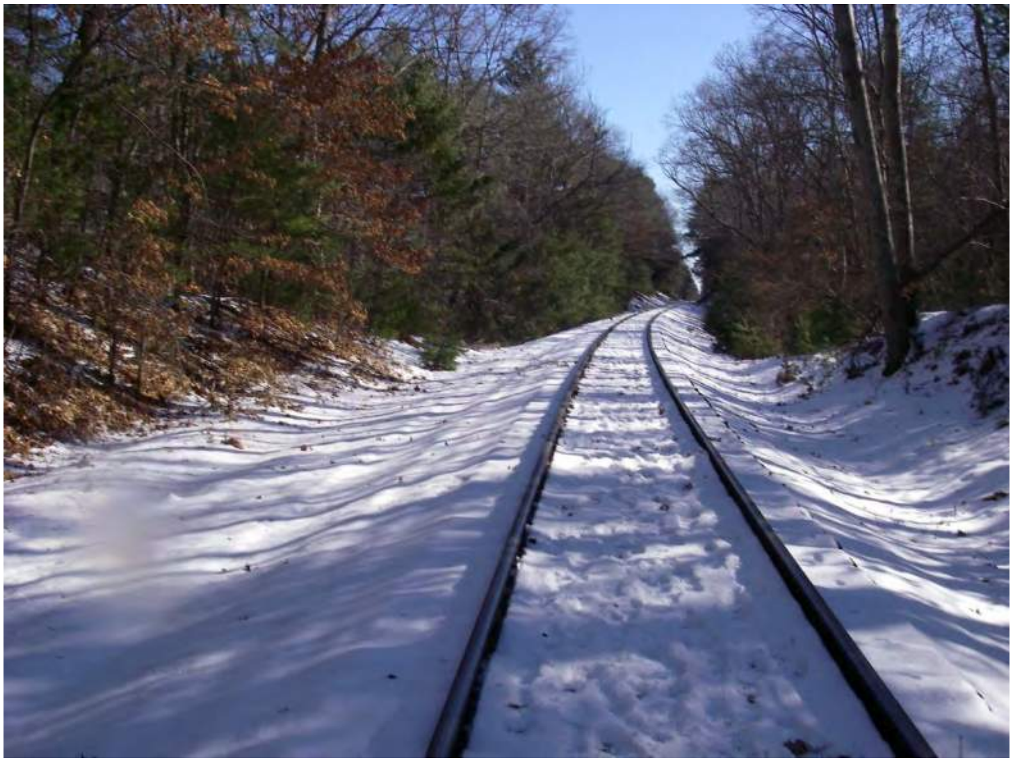
| Photo No. | Date: |
|---|---|
| 4 | 1/22/2020 |

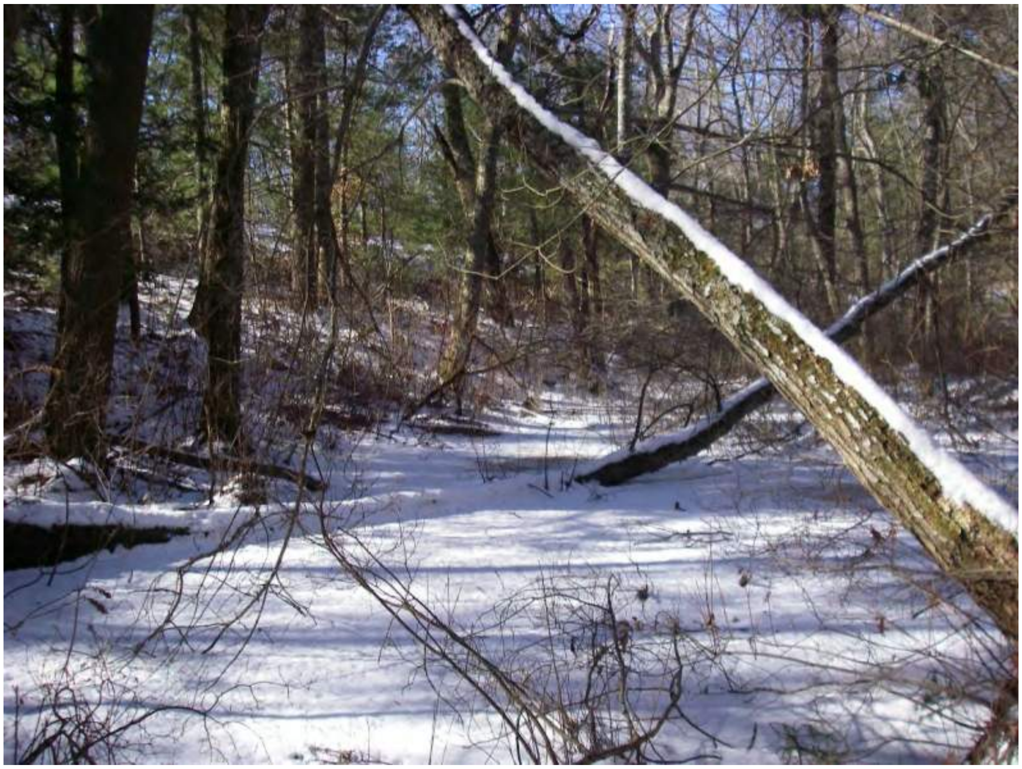
**Direction Photo Taken:**
West.

**Description:**
View of extension of Perennial Stream 1 continuing westward along the toe-of-slope of the railroad embankment. Wetland 1A located in the right hand portion of the photograph.



## PHOTOGRAPHIC LOG

| | | |
|---|---|---|
| **Site Location:** MassDOT Rail, Norton and Taunton, Massachusetts | | **Project No.** E2X83500 |
| **Photo No.**<br>5 | **Date:**<br>1/22/2020 |  |
| **Direction Photo Taken:**<br>East. | | |
| **Description:**<br>View of railroad right-of-way looking away from bridge. Photograph taken approximately 300 feet east of the bridge. | | |

| | | |
|---|---|---|
| **Photo No.**<br>6 | **Date:**<br>1/22/2020 |  |
| **Direction Photo Taken:**<br>West. | | |
| **Description:**<br>View of Wetland 2. Photograph taken from delineation flag W1-8. | | |